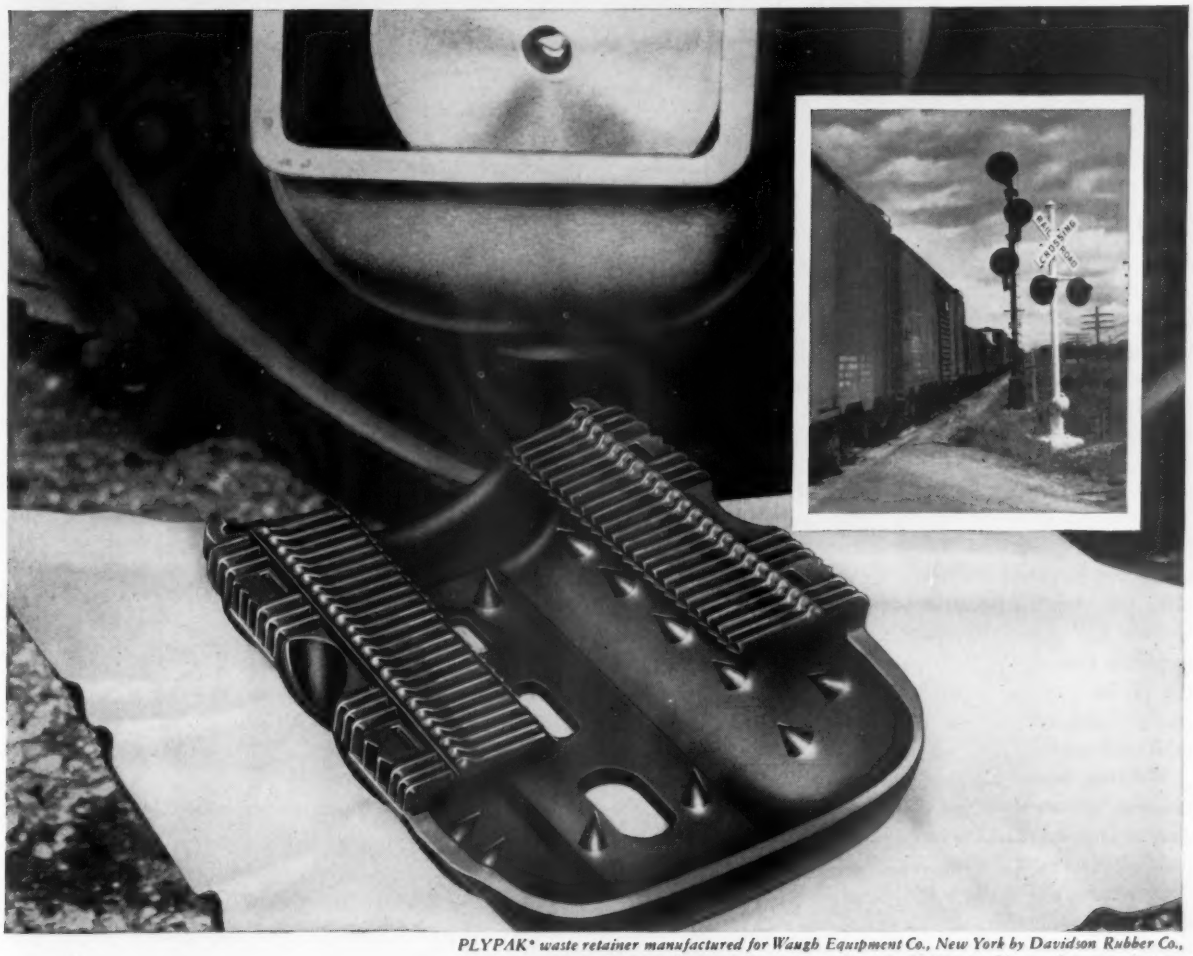
Another new development using

B. F. Goodrich Chemical *raw materials*



PLYPAK waste retainer manufactured for Waugh Equipment Co., New York by Davidson Rubber Co., Boston, Mass. B. F. Goodrich Chemical Company supplies only the Hycar rubber used in manufacture.*

HEAT'S OFF HOT BOXES!

ASK any railroader about "hot boxes"—overheated freight car journals—and he'll tell you they cause delayed schedules, repairs, even derailments. Losses run into the millions yearly. No easy problem to solve—but a manufacturer did it with a waste retainer molded from a compound employing Hycar American rubber.

Oil-saturated waste lubricates the journal but tends to work up around it. A jolt to the car often displaces the bearings momentarily, trapping waste beneath them. Result—lubrication is cut off and a hot box develops. In this new retainer, comb-like projections molded into it *prevent* waste from climbing the journal and catching under the bearing.

Also, lubrication is actually improved. Vertical motion of the car alternately squeezes and releases the resilient retainer, giving a pumping action to help circulate the oil.

Parts made of Hycar rubber improve operations and cut costs in the transportation and other industries. Perhaps Hycar's exceptional resistance to abrasion, heat, cold, oil and gas can help you solve a tough product improvement or development problem. For technical information, please write Department CJ-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company
*T. M. Reg. U. S. Pat. Off.

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GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Philblack* research

"Eureka! – I have found it!" is not a frequent cry among Phillips research scientists.

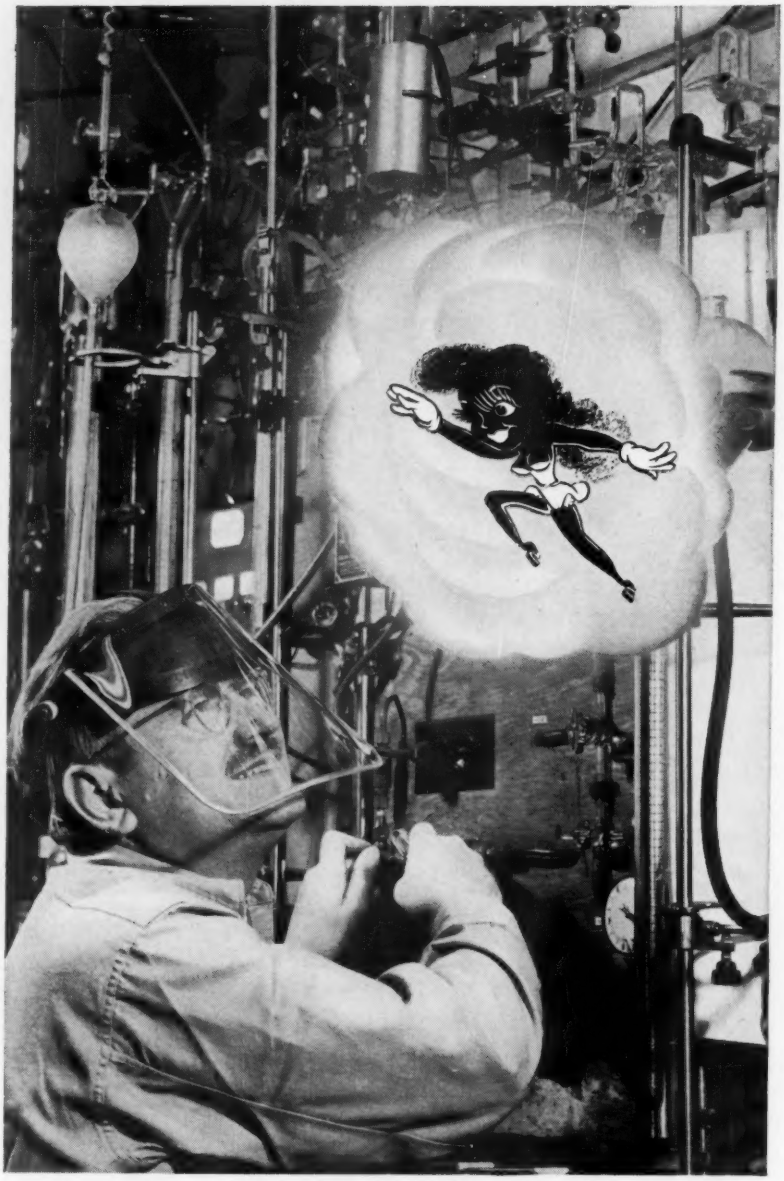
The problems we tackle are so complicated that many discoveries are needed to convert an interesting laboratory POSSIBILITY ***into a versatile, useful*** PRODUCT ***like Philblack.***

Furthermore, our research on carbon black did not end with our production of the first pound of Philblack. Indeed, after two decades of intensive study, we are still devoting research brainpower to a more complete understanding of the mechanism by which Philblack reinforces rubber compounds with such success.

Working intently, day after day, to improve stress-strain and flex properties, to step up abrasion resistance and hold down costs, has naturally given us a remarkable background in compounding rubber. We've learned a lot about the whys and wherefores of rubber products during manufacture and use.

If you are troubled with a recipe – or an application of rubber with black – get in touch with us. Our technical staff may have the answers you're looking for right now.

*A TRADEMARK



Intensive Philblack research proceeds on many fronts from the fundamental structure of black to the production and evaluation of Philblack in a wide variety of recipes. Our unmatched background in rubber and carbon black is at your service through your Philblack Technical Representative. Ask him about stepping up your compounding efficiency with Philblack.

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A **Philblack A FEF Fast Extrusion Furnace**
Ideal for smooth tubing, accurate molding, satiny finish. Mixes easily. High, hot tensile. Disperses heat. Non-staining.

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Superior abrasion resistance at moderate cost. Very high resistance to cuts and cracks. More tread miles at high speeds.

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For long, durable life. Good electrical conductivity. Excellent flex. Fine dispersion.

E **Philblack E SAF Super Abrasion Furnace**
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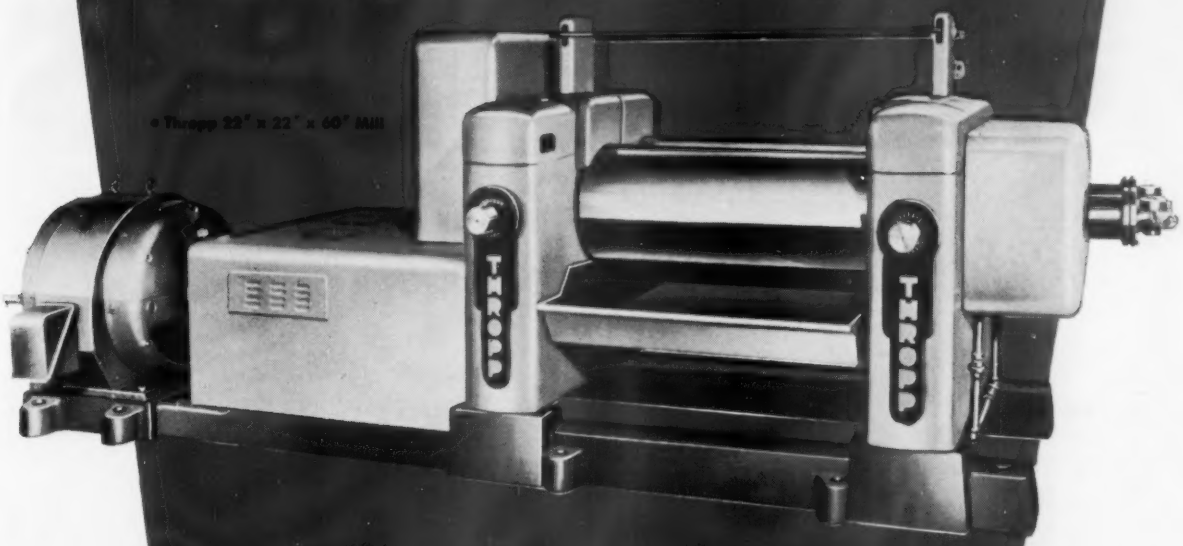

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utilize extra solvent-resistance of CHEMIGUM

Collapsible, rubberized fabric tanks that hold up to 10,000 gallons, yet roll into highly portable packages when empty, are the latest development in the handling of bulk fluids. They are proving a boon to the military and operators of trucks, earth-movers, oil rigs or other heavy equipment in remote areas where temporary storage of fuel is required.

Twin problem for designers of these "pillow" tanks was finding a workable rubber which could withstand the variety of fuels and field conditions that might be encountered. They finally chose CHEMIGUM—easiest-processing of the nitrile rubbers and usually resistant to oil, greases and solvents.

In production, CHEMIGUM breaks down rapidly on the mill to give uniform solutions which are easily applied to the Nylon fabric. In use, CHEMIGUM imparts high resistance to all fuels, plus excellent flexibility, good adhesion and low permeability in any weather.

CHEMIGUM differs from other nitrile rubbers in that it is designed and made to process as do GR-S type rubbers, without sacrifice of its oil-resistance and general physical properties. CHEMIGUM does not toughen on the mill, but actually softens to give high-quality products at lower cost.

How can today's lighter-colored, smaller-baled CHEMIGUM help lower your costs or improve your product's quality? Full technical help and samples are yours, from the foremost supplier of synthetic rubbers and resins, by writing to:

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Akron 16, Ohio

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ZnO

is *definitely* in the picture

Of the many advantageous properties of rubber, perhaps the best known and most easily recognized is its resiliency. This property, for example, gives "bounce" and "zip" to golf balls. Zinc Oxide is an essential ingredient in nearly all products made from either natural or synthetic rubber compounds; it is one of the few basic ingredients which increases the wear and abrasion resistance of rubber *without materially decreasing its resiliency*. In the case of golf balls, where toughness is one of the chief requirements, this is an ideal combination of properties.

ST. JOE lead-free ZINC OXIDES are produced by a unique electrothermic method – a modification of the direct-from-ore, or American Process. Zinc Oxides thus produced combine most of the desirable properties of the American and French Process types. ST. JOE ZINC OXIDES are available in grades to fit most any need, and their uniform high quality accounts for their wide use by the country's leading producers of rubber products.

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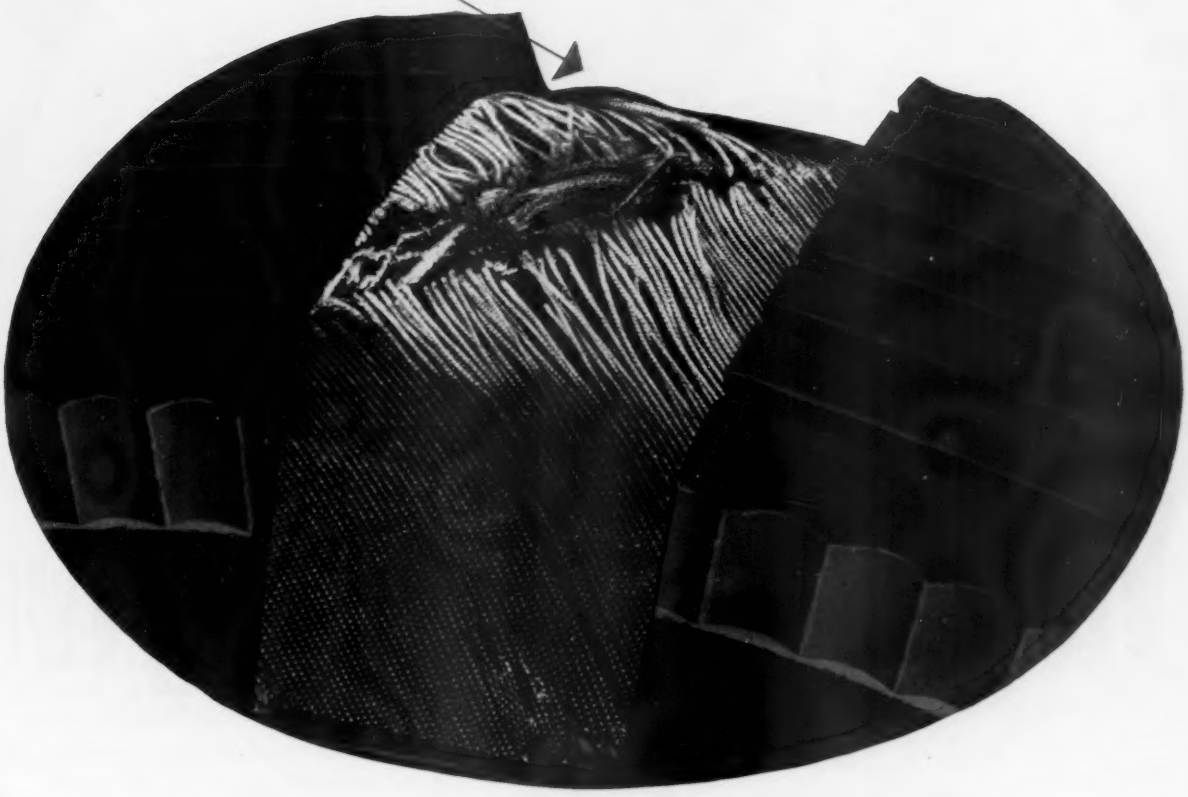
This Can't Happen with GEN-TAC*



This looks like a bruise break but was caused by moisture entering a puncture. Gen-Tac (Vinyl Pyridine Latex) prevents such failures because its remarkable adhesion persists under the worst possible conditions. Gen-Tac can actually produce adhesion of rubber to Nylon that is greater than the strength of the cord itself.

For samples and reference data write to The General Tire & Rubber Company, Chemical Division, Akron, Ohio.

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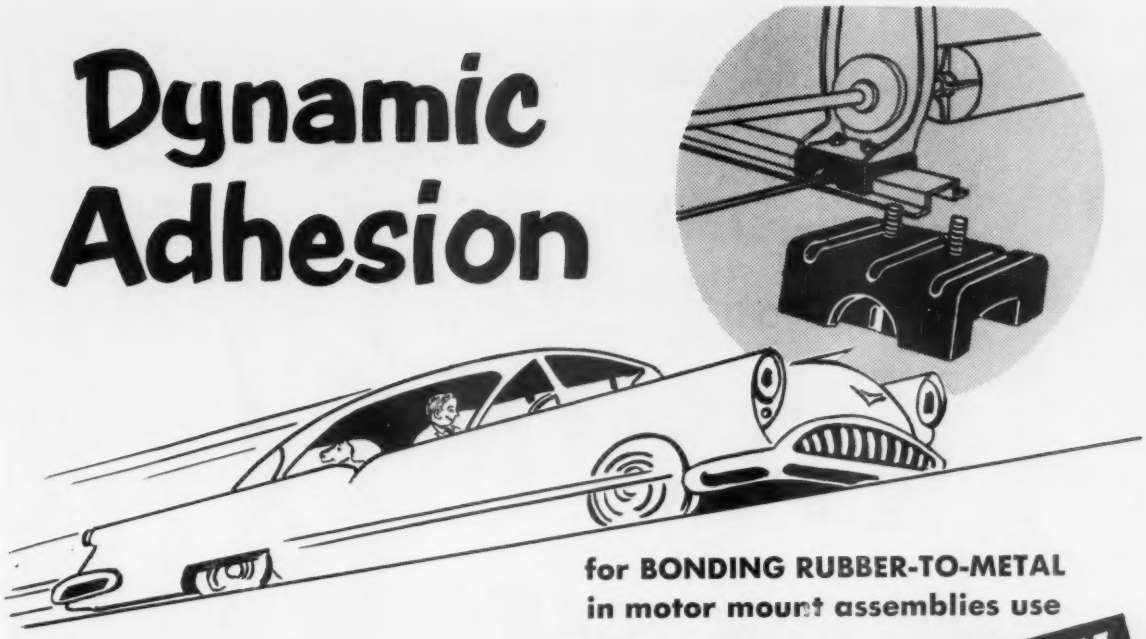

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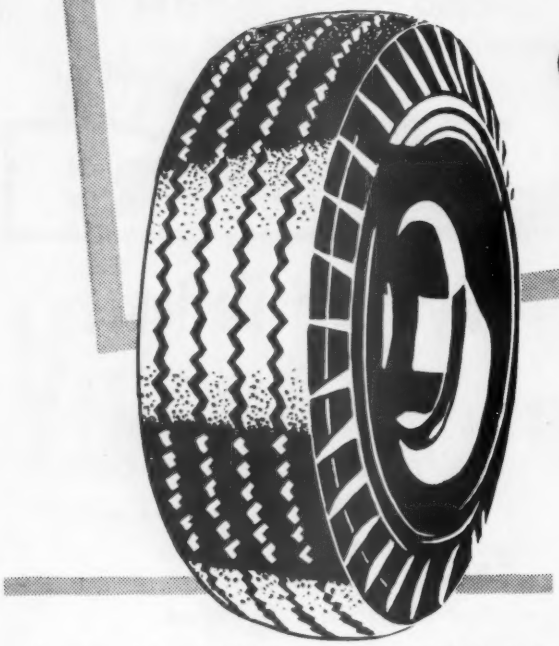

Accept no substitute for this time-tested, highest quality product — CARY "ANTISUN".

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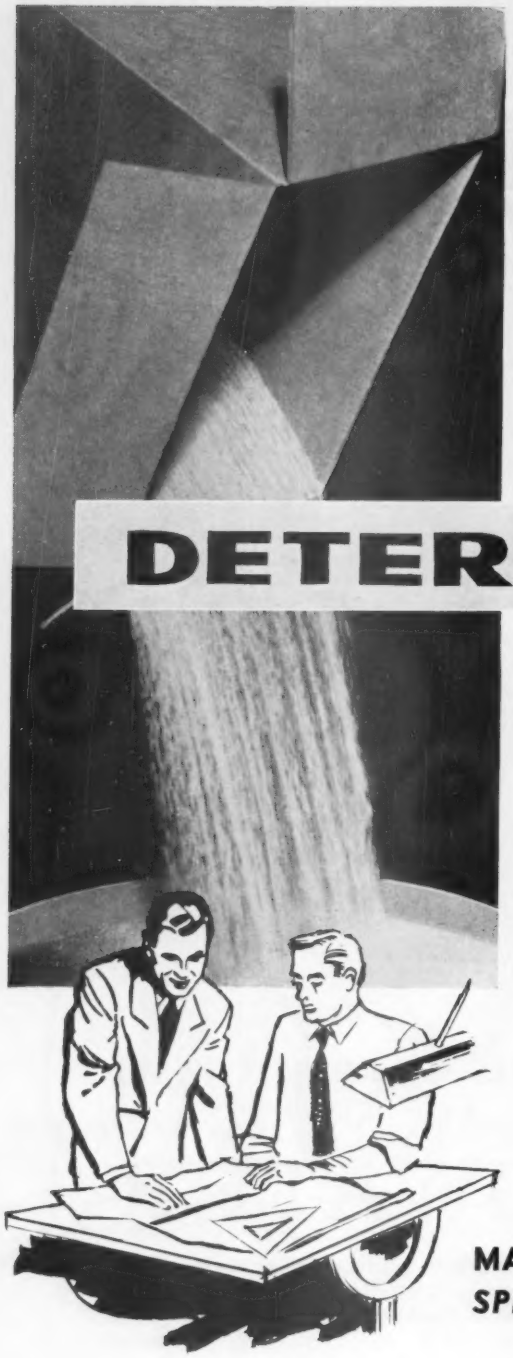

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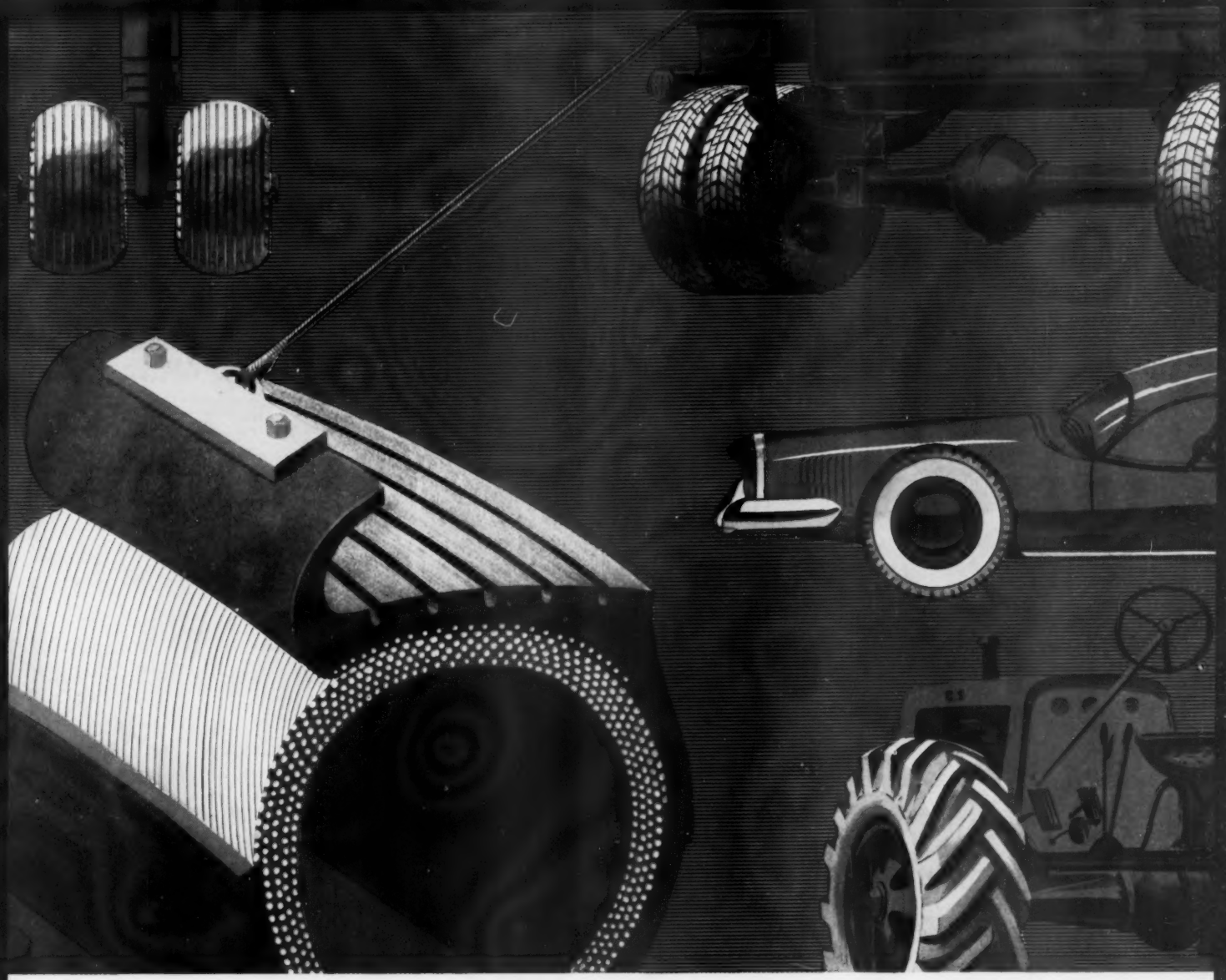

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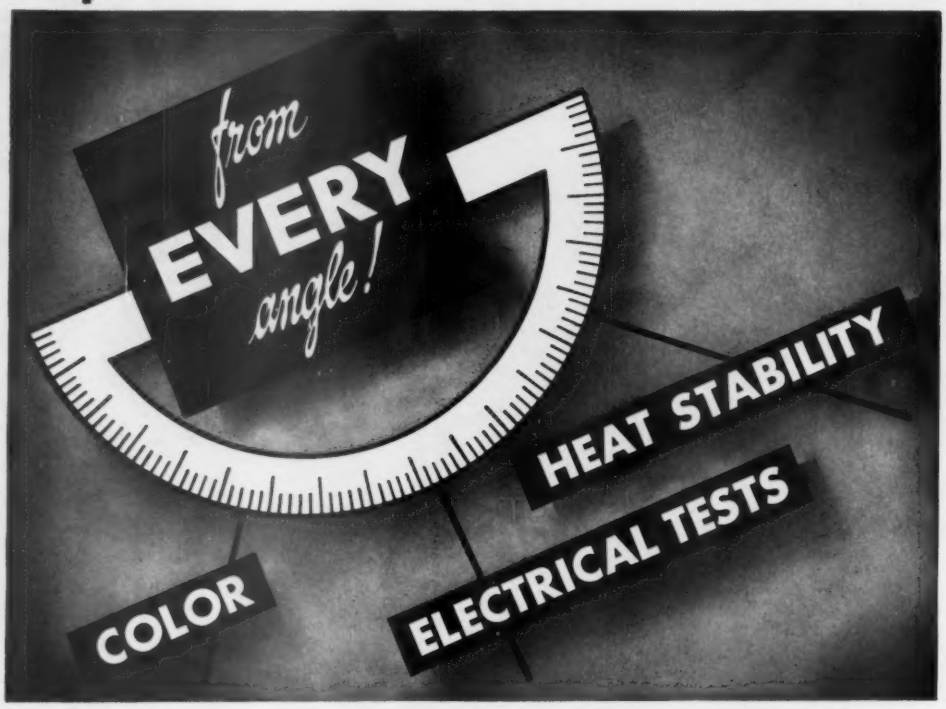

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we did it . . . and we're glad

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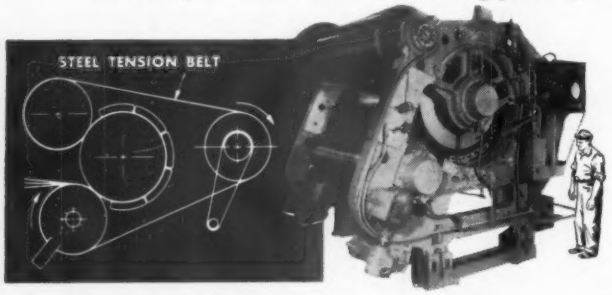
That's why we're glad we designed and built the large special grinding machine that ground and polished that giant steel band to so smooth a surface and high luster.

The band is the *tension belt* of a ROTOCURE*, a machine for the *continuous curing* of flat rubber goods, conveyor belting, floor coverings, gasket materials, etc. In the continuous curing process, the stock moves, under pressure and tension, between a vulcanizing drum and the tension belt; and until **Adamson Engineers** designed and built the ROTOCURE* BELT GRINDER, the imperfections or irregularities in the belt surface were reflected in the finished product.



ROTOCURE* and schematic diagram of operation.

On this new Adamson machine, ROTOCURE* belts can now be ground to tolerances of plus or minus one-thousandths of an inch, which means that a flatter, smoother, more accurate, better looking and longer wearing product can be made.

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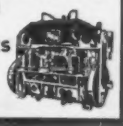
ENCOURAGE OUR YOUTH To CONSIDER The OPPORTUNITIES In ENGINEERING and SCIENCE



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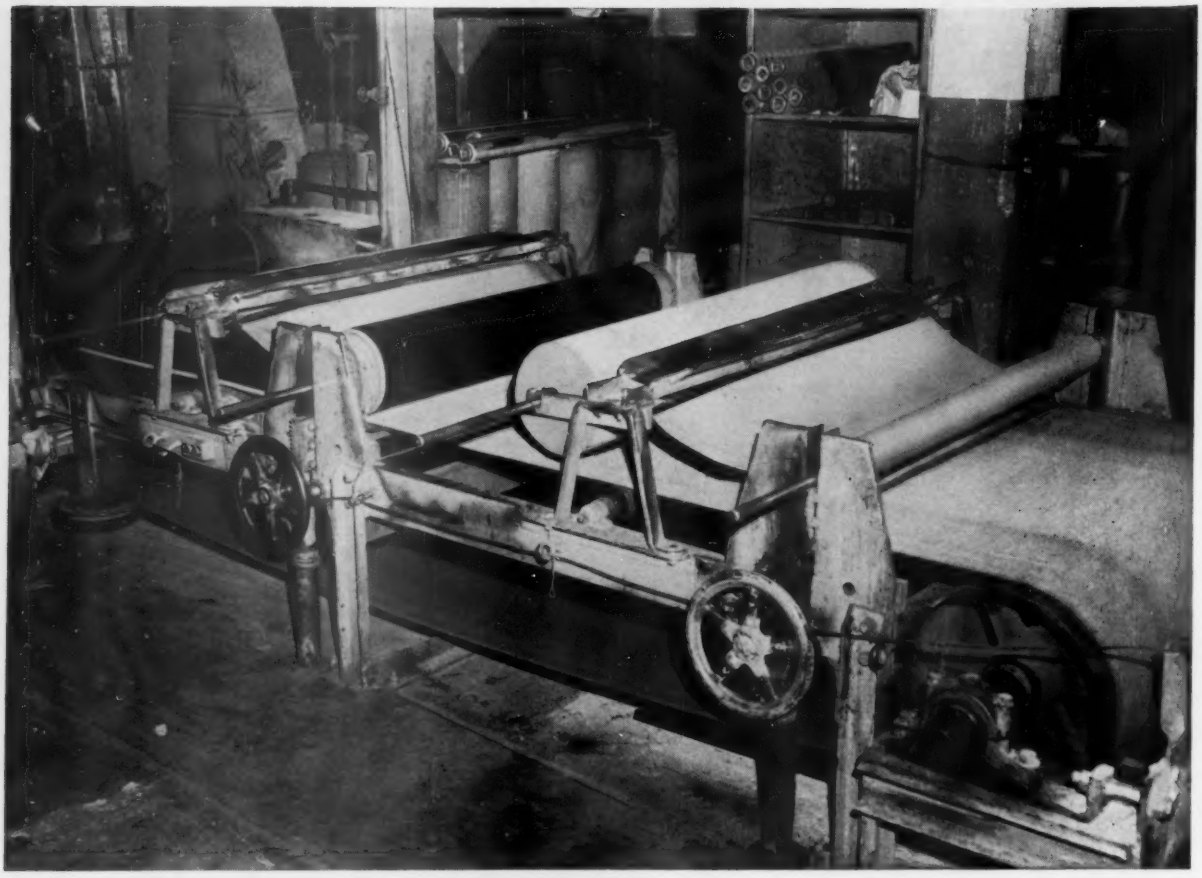

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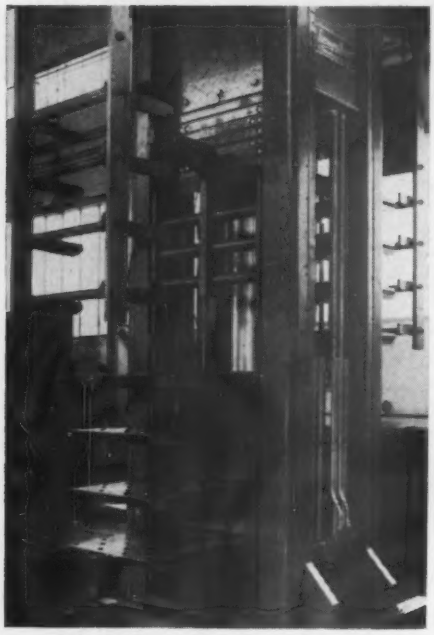

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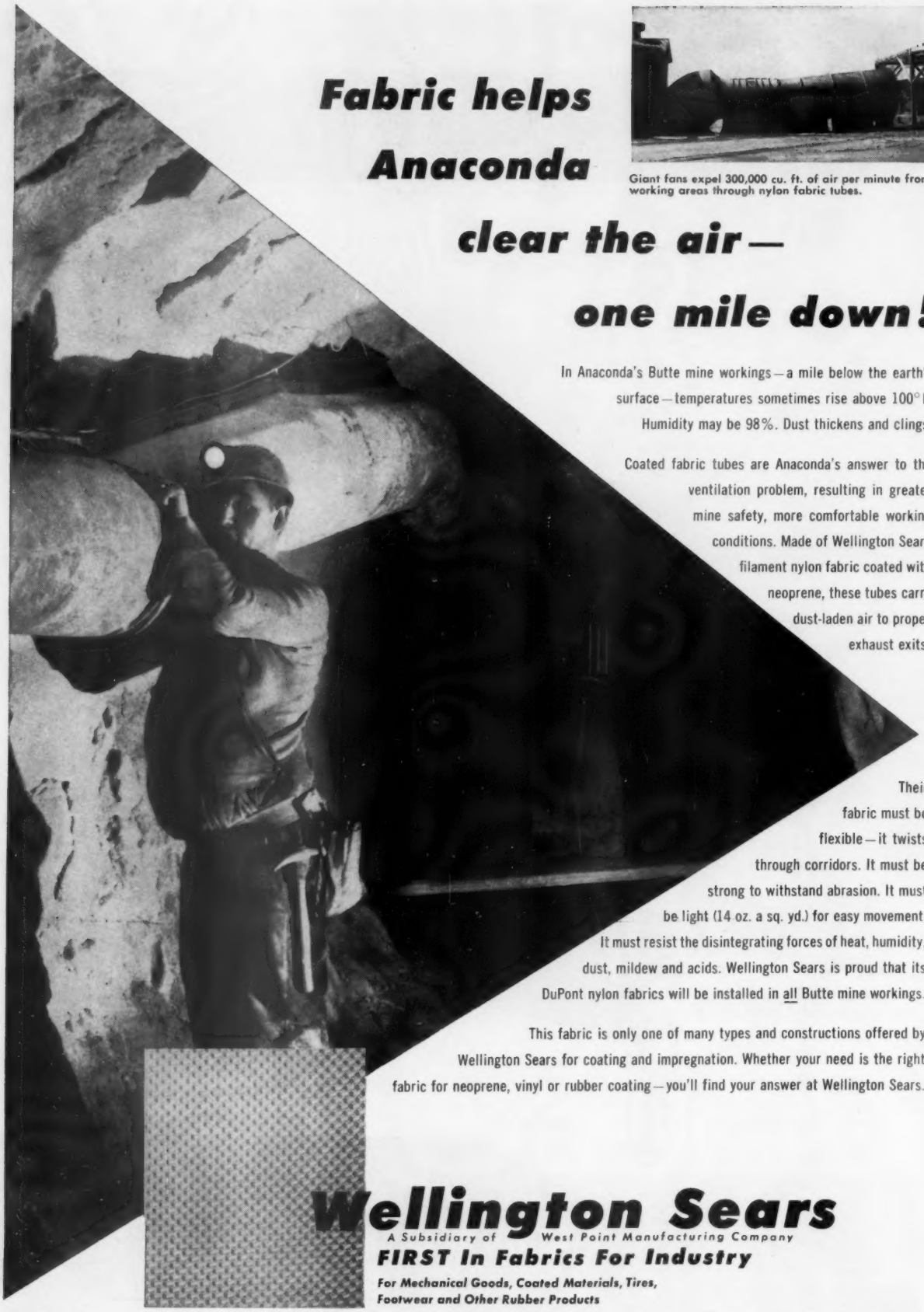

In Anaconda's Butte mine workings—a mile below the earth's surface—temperatures sometimes rise above 100° F. Humidity may be 98%. Dust thickens and clings.

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Their fabric must be flexible—it twists through corridors. It must be strong to withstand abrasion. It must be light (14 oz. a sq. yd.) for easy movement. It must resist the disintegrating forces of heat, humidity, dust, mildew and acids. Wellington Sears is proud that its DuPont nylon fabrics will be installed in all Butte mine workings.

This fabric is only one of many types and constructions offered by Wellington Sears for coating and impregnation. Whether your need is the right fabric for neoprene, vinyl or rubber coating—you'll find your answer at Wellington Sears.

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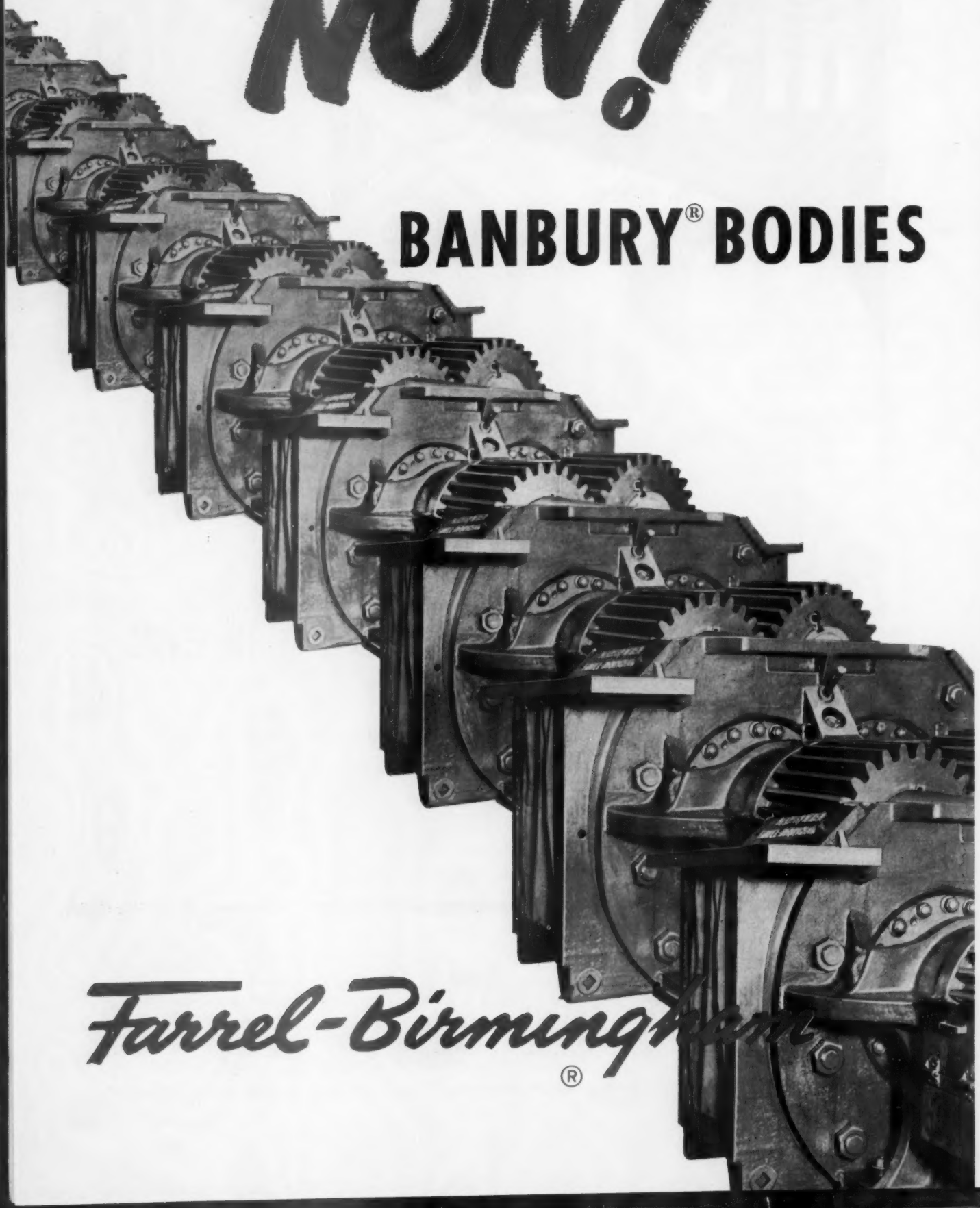


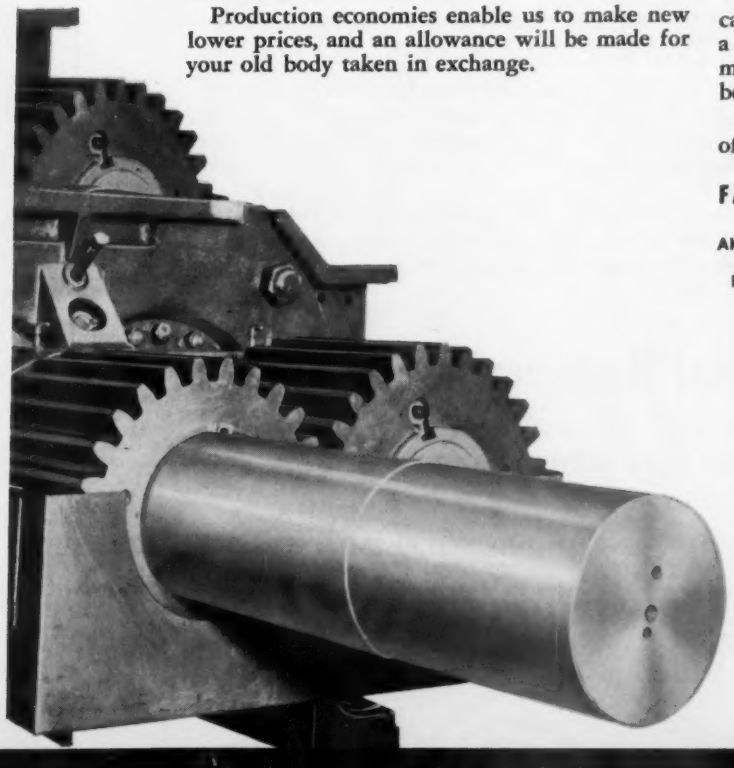
Farrel-Birmingham®

—FASTER...AT LOWER COST

Quick delivery— from Buffalo for Western points Derby for Eastern points

We are preparing to stock a large number of new and rebuilt Banbury mixer bodies to give you quicker service. An accelerated production schedule will enable us to put this program into effect during the second quarter of 1955. Bodies will be shipped out on the same day your order is received . . . no more waiting out an order . . . less loss from down time.

Production economies enable us to make new lower prices, and an allowance will be made for your old body taken in exchange.



We chose our Buffalo plant for service to western points, because it is within 200 miles of Akron, and it is large and well equipped. It is a good central point for shipment to any points west—by rail, truck or water.

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Banbury bodies rebuilt by Farrel-Birmingham carry the same guarantee as our new bodies. Such a guarantee by the manufacturer of the Banbury mixer provides assurance that the rebuilt body will be "as good as new" when it goes back into service.

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Both the automatic machine, illustrated above, and the semi-automatic machine are self-contained units which need only be connected with electrical and cooling water supplies for immediate production.

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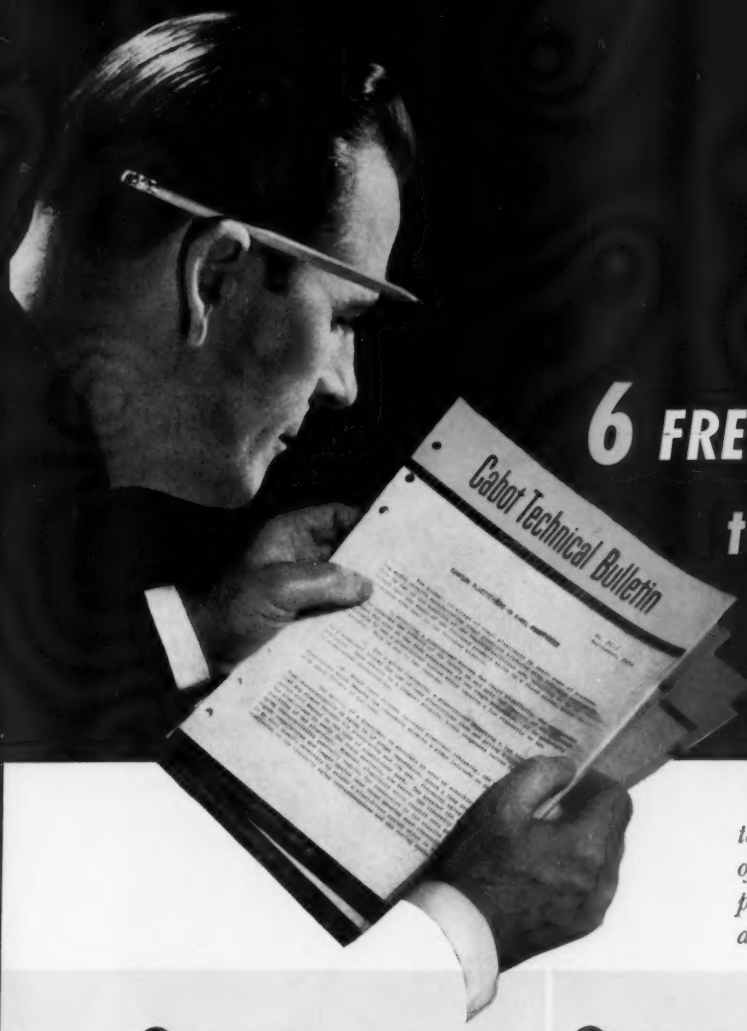

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1 Efficiency Factors For Cabot Plasticizers

Tells how to calculate the concentration of a plasticizer system to obtain a room temperature flexibility equal to that of a known compound. Examples included. Efficiency factors given for Cabot's complete range of plasticizers.

2 Cabflex® DDP in 80° C. Vinyl Insulation Compounds

Advantages of Cabflex DDP over TCP stressed. Test results given for recommended formulation. Comparison shows Cabflex DDP is lower in cost and superior in every property measured against two standard 80° C. vinyl insulation compounds. (Superseded by No. 4)

3 Cabflex® Plasticizers in Vinyl Plastisols

Lists considerations for selecting a plasticizer system for vinyl plastisols. Figure 1 shows differences in initial and aged viscosities of plastisol formulations containing various Cabflex plasticizers.

4 Cabflex® DDP in High Temperature Vinyl Insulation Compounds

Contains detailed discussion on use of Cabflex DDP in 80° C. and 90° C. wire insulation. Information given for effective use of antioxidants. Values given for insulation resistance and retention of elongation of wire compounds run in factory.

5 Commercial Plasticizers and Their Manufacturers

Bulletin lists trade names, chemical composition and manufacturers of plasticizers. In three sections: Section I, Trade Names; Section II, Chemical Names; Section III, Manufacturers and Their Plasticizers.

6 Water Extraction Properties of Vinyl Plasticizers

Includes the water extraction properties of 12 commercial plasticizers. Tests are based upon a static water extraction test in which activated carbon in the water overcomes the low plasticizer solubility of a limited volume of extractant. Results given for 1, 4, 10, 23 days of immersion.

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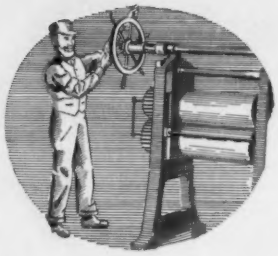

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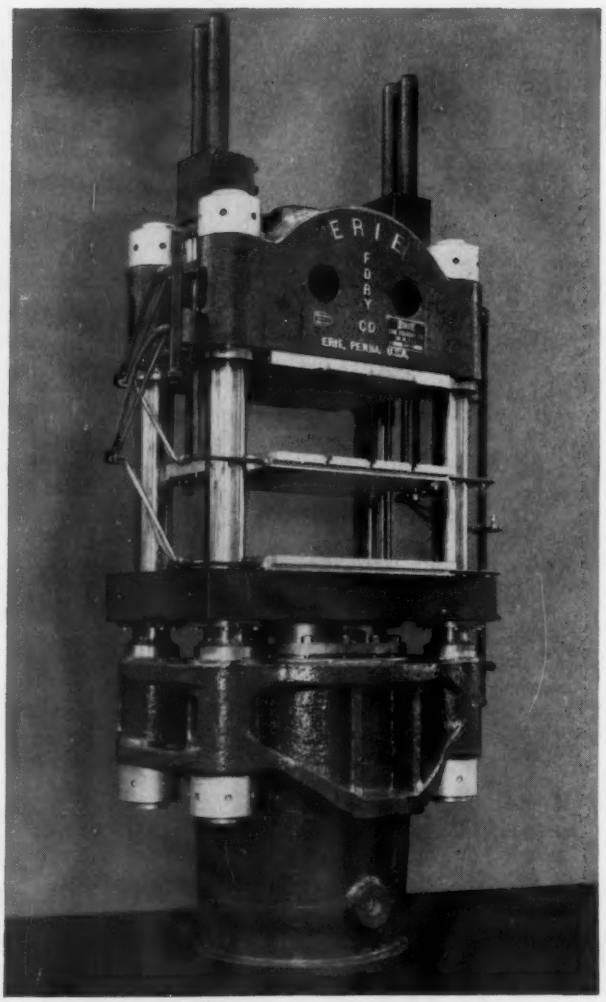

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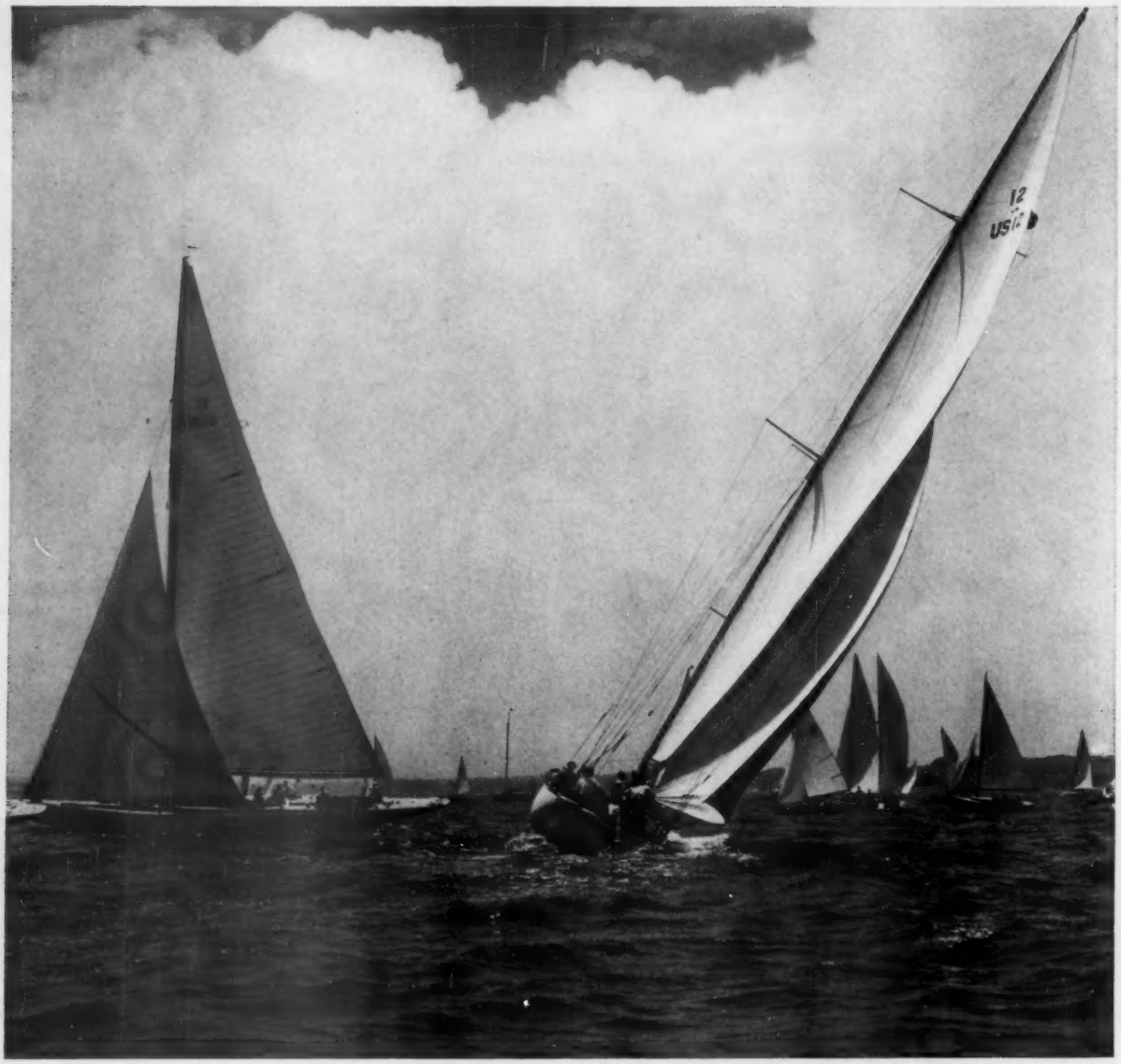

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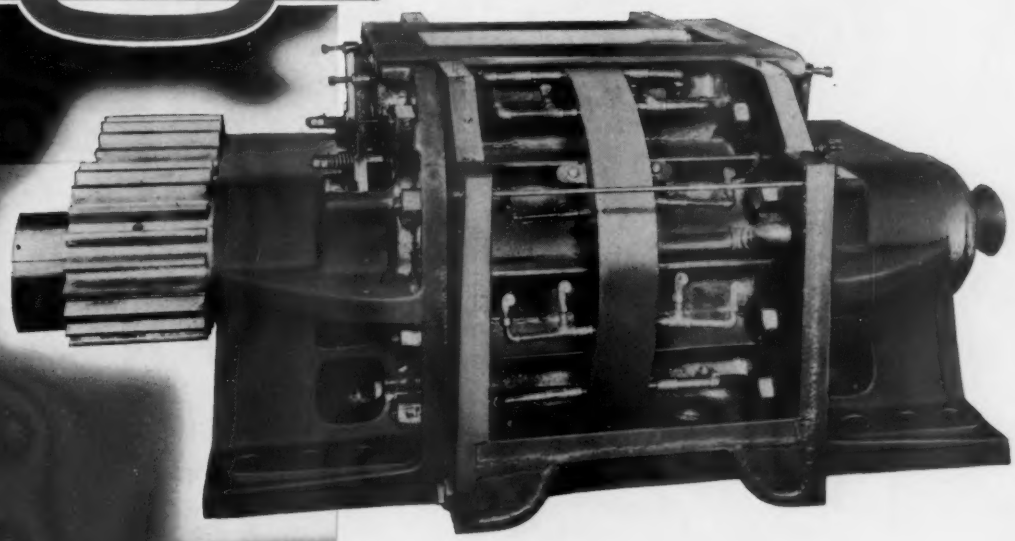

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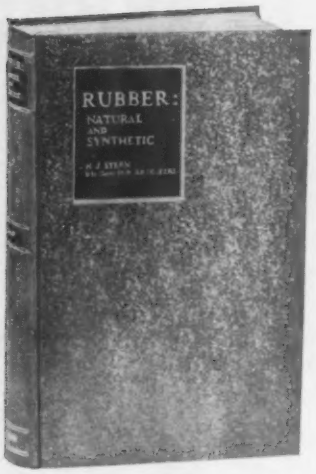

491 Pages — 200 Illustrations

RUBBER:

Natural and Synthetic

By H. J. STERN

B.Sc., Ph.D., A.R.I.C., F.I.R.I.

Price: $12.00* (in U. S. and Canada)

(Orders for all other countries should be sent with remittance of 75s. 0d. to the publisher: MACLAREN & SONS, LTD., Stafford House, Norfolk Street, London, W.C.2, England).

About the Book–

This book fills the need for an English-language text book on all phases of rubber and rubber products manufacture. As indicated by the chapter heads, the book is of interest to rubber manufacturers, suppliers of chemicals and machinery, rubber technologists and to students of rubber who will find present-day technical procedures clearly defined.

Part I covers natural rubber production, composition, properties and vulcanization as well as compounding ingredients, machinery, reclaiming and latex. Part II covers the development, manufacture and uses of synthetic rubber and latices, synthetic resins and plastics. In addition the manufacture of various rubber products are fully covered, including soles and heels, extruded goods, bonding, hollow goods, sponge and expanded rubber, belting, hose, tires, tubes and hard rubber.

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About the Author—

Dr. Stern has been engaged as a chemist in the rubber industry for more than 25 years and since 1935 has practiced successfully in London as a Consultant. He is the author of "Practical Latex Work" and of many publications concerned with the scientific and technological aspects of natural and synthetic rubber.

SUMMARY OF CONTENTS BY CHAPTERS

Part I

1. **Historical Introduction; Mastication; Vulcanization.**
2. **Plantation Rubber.**
3. **Natural Rubber: Composition, Reactions, Derivatives.**
4. **Properties of Vulcanized Rubber.**
5. **Compounding Ingredients.**
6. **Rubber Machinery; Solvents and Solutions; Reclaiming.**
7. **Latex.**

Part II

8. **Synthetic Rubber (History and Development).**
9. **Manufacture and Technology of Synthetic Rubbers.**
10. **Synthetic Rubber Latices.**
11. **Synthetic Resins; Plastics.**
12. **Manufacturing Processes (of various rubber products).**
13. **Testing and Analysis.**

Sources of Further Information; Metric Equivalents; Subject Index.

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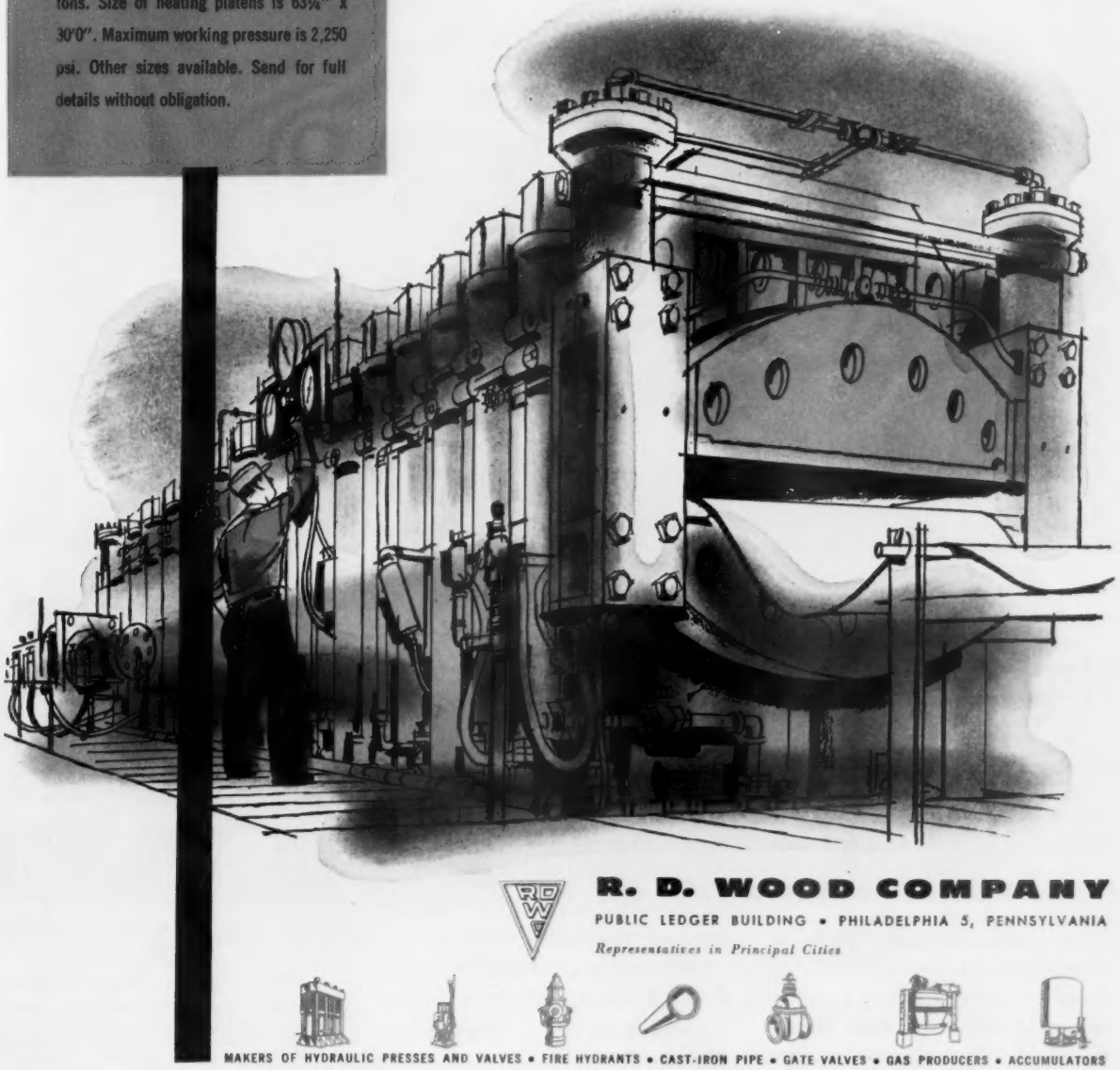

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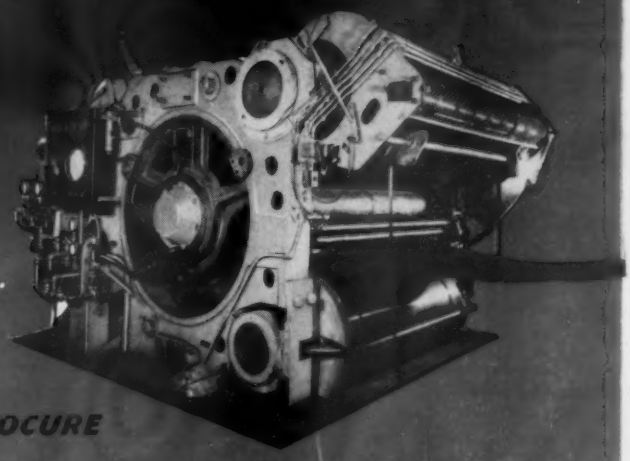

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Continuous operation without opening, cooling, re-heating and closing

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ACTIVATOR NEWS

HORSE HEAD PRODUCTS

A supplement to THE ACTIVATOR—the house organ issued by The New Jersey Zinc Company for over 15 years to aid the Rubber Industry in its use of Zinc Oxide.

PROPIONATE COATING ADDS NOVEL FEATURES TO ZINC OXIDE

Rubber compounders and production men alike, in recent years, have helped to write a new chapter in the book of zinc oxide knowledge. For they have found, as they increased their use of zinc propionate coated zinc oxide, that this pigment—Protox-166*—has some advantages not available in untreated oxide.

Several of those features of Protox-166 have been described in detail in previous issues of ACTIVATOR NEWS, and others will appear here later. For your convenience, the list of such properties is shown in the attached table. If you have not yet evaluated Protox-166 in your compounds, we shall be glad to send you samples.

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*U. S. Patents 2,303,329 and 2,303,330

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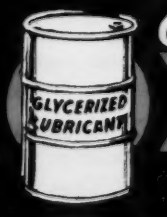

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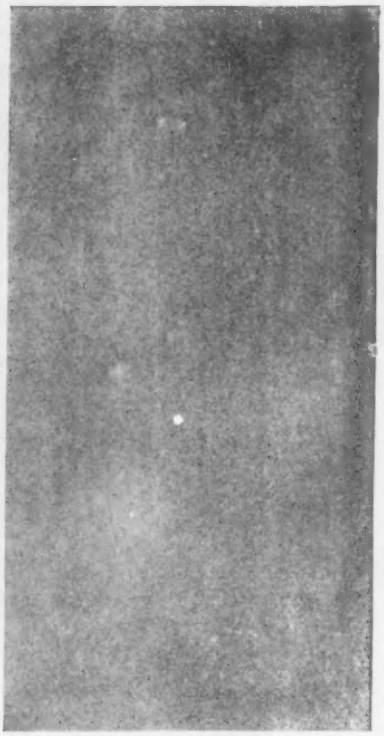
1. 2:1 uncoated carbonate: natural rubber stock (all photographs enlarged 35 times). Note large agglomerates.

2. Masterbatching has reduced the agglomerates in the same formula.



3. 2:1 PURECAL SC: natural rubber stock, *but without masterbatching!* The few lumps are smaller, softer, and break down readily during subsequent processing.

After eight years of research and development, plus three years of extensive field testing, Wyandotte offers a coated ultrafine calcium carbonate . . . PURECAL SC. It disperses readily, and is entirely different from any other coated calcium carbonate on the market.

Wyandotte PURECAL* SC is a coated ultrafine calcium carbonate, developed specifically to overcome processing difficulties attending the use of uncoated types. It imparts essentially the same characteristics as uncoated ultrafine carbonates, but in addition, it can be dispersed without special handling. It thereby shortens mixing time and lowers mixing costs.

The organic coating on PURECAL SC is unique . . . this coating does not retard cures. Thus, when PURECAL SC replaces neutral or retarding carbonates and clays, accelerator requirements may often be reduced 50% or more, with resultant savings.

The coating on PURECAL SC does not impair the excellent aging characteristics of the ultrafine carbonate, nor does it affect the color. In fact, in many applications where PURECAL SC is used in place of less bright carbonates and clays, the loading requirements for expensive pigments, such as titanium dioxide, can be reduced. The results are lower formula costs, and consistent quality – in some cases, improved quality.

The unique coating of PURECAL SC possesses other advantages, too . . . it does not lower modulus, reduce resilience, or increase the heat build-up. Thus, higher loadings are possible with PURECAL SC. When more SC is used than the carbonate or clay it replaces, the results are more end-product, improved quality, and often lower volume costs.

Field results with Purecal SC

Field results on commercial all-GR-S compounds, which formerly contained ultrafine carbonate as one of the leading materials, showed these improvements when PURECAL SC was used:

A 16% increase

Tire carcass stock, a 16% increase in *tensile strength*

A 26% increase

Canvas shoe soling, a 26% increase in *abrasion resistance*

A 132% increase

Belt carcass stock, a 132% increase in *flex life*

An 88% increase

Hose carcass stock, an 88% increase in *tear resistance*

A 28% increase

CV wire covering, a 28% increase in *extrusion speed*

In all findings to date, PURECAL SC gave high tensiles, high elongations, good tear resistance, and good flex life.

Exhaustive compounding studies, covering PURECAL SC in various rubber systems, have been made in our own laboratory. Both black and non-black stocks, with tensile strengths from 900 to 3500 psi, have been developed. With this information, PURECAL SC stocks of equivalent physical properties, but in a variety of elastomer combinations, can be selected to take advantage of fluctuations in the price of rubber.

It will pay you to investigate Wyandotte PURECAL SC now. It may be that PURECAL SC will give you one or more of the following benefits:

- Eliminate a handling step, and thereby shorten your processing time, lower your mixing costs.
- Reduce accelerator requirements or expensive pigment requirements, with resultant formula savings.
- Permit high loadings, thus producing more end-product, improving quality, and lowering your volume costs.

Data, Samples, Technical Assistance

When writing for data, samples, or technical assistance, please help us to help you by giving as much information as possible about the process or problem with which you are concerned. This will enable us to assess your needs more exactly and fill your requests more promptly. *Wyandotte Chemicals Corp., Wyandotte, Mich. Offices in principal cities.* *REG. U.S. PAT. OFF.

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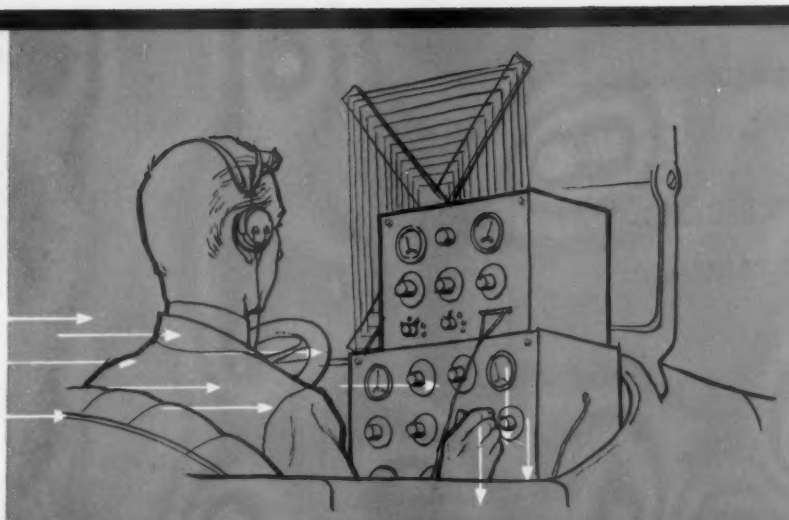
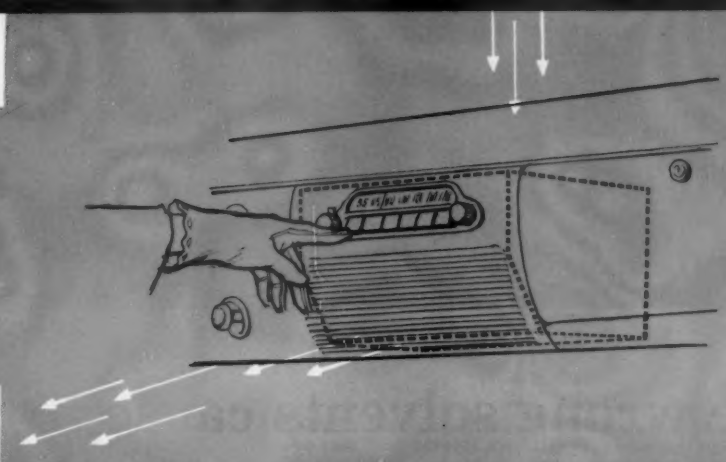


to here?



Answer:
Five Years.

Early radios in automobiles, like the 1924 model shown, were apt to be homemade affairs. It wasn't until 1929 that large-scale commercial adaptation started and expanded until now there are about twenty-five million radios in cars.

This rapid development has been typical of all parts of the automotive field including rubber. Here Monsanto has played an important role, steadily increasing the number of chemical products used in improving rubber performance.

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SKELLYSOLVE-E. For use wherever a relatively slow drying solvent is desired.

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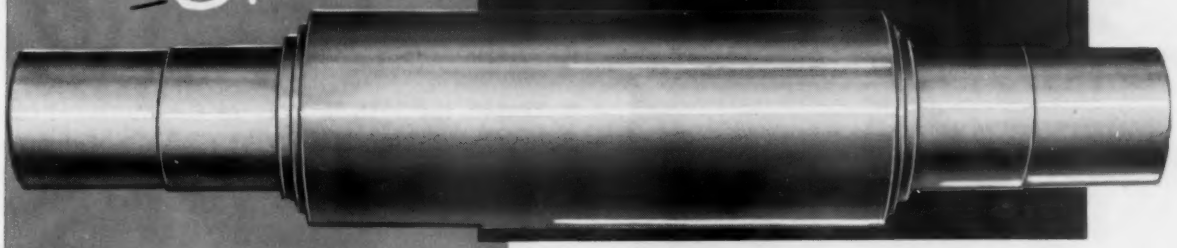

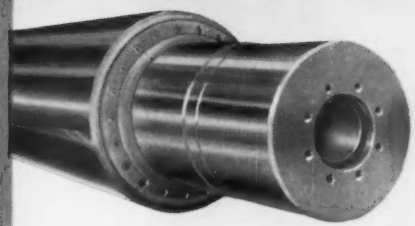

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Our more than 50 years' experience in the design and manufacture of rolls can be helpful in solving your processing problems. Your inquiry is solicited.

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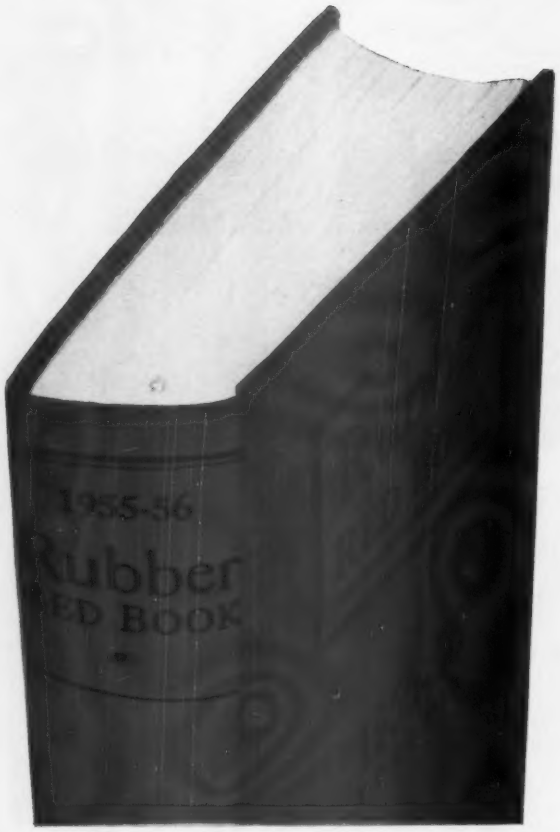

Though the 1955-56 issue of the RUBBER RED BOOK will not close until next April, it is not too early to give consideration to the use of space in that issue and to include the necessary amount in your 1955 budget.

The Editors are planning an even larger and more comprehensive 1955-56 RUBBER RED BOOK. Each issue has been more complete than the previous one — has had more pages, more rubber companies and suppliers, more new listings, new sections, improved and expanded sections, new information added. Yes, every new edition is more complete and more useful . . . and users mince no words in telling us so!

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Make sure that your company is represented with adequate advertising space in the 1955-56 issue. During the two-year life of this edition buying decisions involving more than $4 Billion will be made. Your advertisement in the RUBBER RED BOOK will be just like having your own salesman present when these decisions are being made . . . **but your products may not even be considered if information on them is not available at this critical time.**

Plan now for sufficient space in the next edition to tell the full story of your products . . . your services . . . your equipment. Send in the Space Reservation Coupon (on opposite page) today!

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¼ Page	55.	2¼ Pages, each	53.
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Other Colors	extra 85.		
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Hundreds of letters are on file attesting to the worth of the RUBBER RED BOOK. Users stress its **practical value** . . the evident **thoroughness** with which each section has been developed . . the intimate **knowledge** of the rubber industry that is so apparent . . the infinite **detail** and wide **variety** of its contents.

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Closing Date for Copy — April 1, 1955

Publication Date — June, 1955

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SIGNED BY _____ TITLE _____

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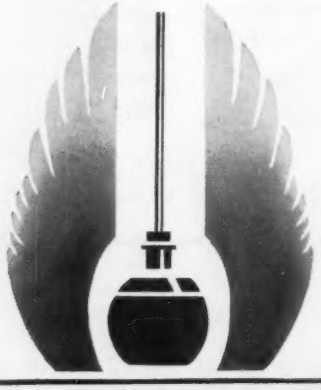

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Bloom PROBLEMS?

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CRYSTEX 85% Insoluble Sulphur

CAN SOLVE THEM AND:

1. improve product quality and appearance

Crystex, because of its high insolubility in rubber, cannot migrate and "bloom" like ordinary sulphur in your rubber compounds. This assures better surface appearance, particularly important in white side-walls and other light colored consumer goods in which "yellow spots" would be objectionable.

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2. save on plant operation costs

A stock blended with Crystex can be kept for long periods before vulcanization without the danger of blooming. Mixing and vulcanization schedules can be made more flexible to permit maximum utilization of machinery and labor without the worry of a "time element" imposed by the danger of bloom.

3. increase compounding flexibility

Formulating with Crystex will allow variations to be made in factory recipes that tend to be "scorchy"; its use will control the degree of tackiness of factory stocks. The unusual characteristic of being insoluble in "anything and everything" except more sulphur may suggest additional uses in your formulations.

Enthusiastic acceptance of Stauffer CRYSTEX by the rubber industry has necessitated the construction of a new plant, and CRYSTEX is now produced at both Chauncey, N.Y., and Monongahela, Pa. Packed in 50-pound multiwall paper bags, Stauffer CRYSTEX is available in all quantities up to car-load.

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- a highly reinforcing white pigment
- excellent resistance to scorch
- good dispersing characteristics

ZEOLEX 23*

*Microlitic Zeolite

PHYSICAL PROPERTIES:

pH (20% water slurry)	10-11
Form	Dry Powder
Handling Precautions	None (non-toxic)
Specific Gravity	2.10
Screen Residue (325 mesh)	0.1% Maximum
Free Moisture (Maximum)	5%

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G-M-F and Dibenzo G-M-F

These two activators from the world's leader in rubber chemicals serve as effective non-sulphur vulcanizing agents when used with certain oxidizing materials.

They are particularly effective and most often used for the excellent heat resistance they impart to butyl rubber products.

Though G-M-F is the more economical of the two, Dibenzo G-M-F, with a more delayed action, gives superior scorch safety and is recommended for use wherever scorching is a major problem.

Both offer excellent resistance to heat and have been widely used in commercial butyl stocks for tire-curing bags, wire insulation, and wherever high temperatures require maximum protection.

For more information on the use and advantages of G-M-F and Dibenzo G-M-F in *your* products, write for our free Compounding Research Report #30.

The chart below illustrates the properties of a typical Dibenzo G-M-F activated CV butyl wire insulation stock

BUTYL RHW INSULATION

Physical Properties Meet the Underwriters Laboratories' Provisional Requirements

GR-I 35	100.0
Zinc Oxide	5.0
Calcined Hard Clay	125.0
Process Oil	1.0
SUNPROOF® IMPROVED	2.0
FLEXAMINE	1.0
M-B-T-S	2.0
G-M-F	1.5
VULKLOR	1.0
TONOX	0.1

UNAGED PHYSICAL PROPERTIES

Seconds at 402° F	200% Modulus PSI	Tensile PSI	Elongation	Recovery Index
35	490	740	360	0.18
U. L. Standard	400 min.	700 min.	300 min.	0.375 max.
Aged 168 hours in an Oxygen Bomb at 80° and 300 PSI				
35	630	610 (83%)	280 (78%)	–
U. L. Standard	–	75%	75%	
Aged 20 hours in an Air Bomb at 260°F and 80 PSI				
35	640	730 (99%)	320 (80%)	–
U. L. Standard	–	75% min.	75% min.	

Naugatuck Chemical

Division of United States Rubber Company

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
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RUBBER AGE

Vol. 76, No. 4 JANUARY, 1955

KEL-F ELASTOMER

Properties, Compounding, Vulcanization and Fabrication

By M. E. CONROY, F. J. HONN, L. E. ROBB and D. R. WOLF

The M. W. Kellogg Co., Jersey City, N. J.

KEL-F Elastomer is a fluorocarbon rubber developed by the M. W. Kellogg Company in cooperation with the Office of the Quartermaster General, U. S. Army. As one of the many fluorinated elastomers examined in this joint project with the Quartermaster Corps, it was selected for further development and eventual commercialization because of its unusual combination of elastomeric properties, chemical resistance, and thermal stability.

This article presents a summary of technical information concerning the properties, compounding, vulcanization, and fabrication of Kel-F Elastomer. At present, the supply of this elastomer is limited to experimental quantities. However, pilot plant facilities are near completion, and commercial quantities will be available early in 1955.

Chemically, Kel-F Elastomer is a fully saturated fluorocarbon polymer containing more than 50 per cent fluorine by weight. Elasticity—that is, extensibility combined with high strength—has been attained by incorporation of methylene groups, $-CH_2-$, in the normally rigid, highly fluorinated polymer chain. X-ray diagrams have shown that the polymer is amorphous at temperatures as low as −40°C. On stretching to 300%, typical fiber diagrams are observed, indicating susceptibility to orientation and crystal formation. That the polymer has good thermal stability is shown by the fact that there was no evidence of chain scission or halogen loss after prolonged exposure at 440°F.

Note: Kel-F is the registered trade-mark of the M. W. Kellogg Co. for their fluorocarbon polymers.

Kel-F Elastomer will be available as either a white spongy crumb or compressed sheets. The significant physical properties of the raw gum are shown in Table I.

An Editorial Comment.....

Brief references to Kel-F Elastomer have appeared in print in the past year or so. It is evident from initial investigations that this new synthetic rubber has outstanding properties where resistance to heat and corrosive chemicals is concerned. Its special characteristics practically guarantee the polymer a niche in the market for specialty materials. Although papers on Kel-F Elastomer were recently presented before the ACS Division of Rubber Chemistry, the accompanying article is the first one to be published spelling out the properties, compounding, vulcanization and fabrication of the new rubber. Once again RUBBER AGE is the first technical journal to present a full and accurate account on another basic raw material made available to the rubber industry.—

Editor.

TABLE I—PROPERTIES OF KEL-F ELASTOMER GUM

Specific Gravity	1.85
Fluorine Content	>50%
Color	Translucent, off-white
Tensile (psi)	300-600
Elongation (%)	600-800
Shore A Hardness	40-45
Intrinsic Viscosity, MEK, 30°C.	2-3
Solubility (25% cements)	Ketones, esters, ethers
Storage	> Two years

Compounding

Kel-F Elastomer can be readily compounded, mixed, molded, and extruded using standard rubber processing equipment. The gum bands readily on rolls heated to 125 to 180°F. Once the rubber has banded, the heat of milling is sufficient to maintain the band, and the rolls should then be cooled to avoid scorching as the curatives are added. Unlike unsaturated hydrocarbon rubbers, this new polymer does not break down appreciably during milling.

Vulcanization

Because Kel-F Elastomer is a fully saturated fluorocarbon, it is not readily vulcanized by normal rubber curatives. However, it can be vulcanized with organic peroxides, polyisocyanates, polyamines, and isocyanate-amine combinations. Although the chemistry of its vulcanization is not fully understood, the marked increase in strength and solvent resistance after cure indicates that the elastomer has undergone a chemical change producing a network or cross-linked type of structure. A comparison of the various curing systems is shown in Table II.

Peroxide Vulcanization: Of the organic peroxides which have been used to vulcanize Kel-F Elastomer, benzoyl peroxide (90% containing 10% water) has been found to be the most convenient curative. It is easily dispersed in the rubber and reacts efficiently at normal molding temperatures. The optimum range of benzoyl peroxide concentration is 1.5 to 3.0 parts per 100 parts of rubber. Metal oxides, such as zinc, calcium and lead oxide, and lead salts, such as dibasic lead phosphite, tribasic lead maleate, and tribasic lead sulfate, are both required as accelerators in the benzoyl peroxide cure. At the above peroxide levels, the optimum concentrations of both metal oxide and lead salt are 5 to 10 parts per 100 parts of rubber.

Extensive study of stocks compounded with zinc oxide shows that they have high tensile strength and good aging properties at normal and elevated temperatures. Magnesium and calcium oxides also impart high tensile strength but increase the water absorption characteristics. Lead oxide stocks are characterized by lower moduli and higher elongations. The effects of incorporating various metal oxides and lead salts in the peroxide compound are shown in Table III.

Successful peroxide vulcanization depends on the efficient utilization of free radicals liberated by the peroxide. It is important, therefore, that proper vulcanization temperatures be selected to correspond to a reasonable rate of peroxide decomposition. Too rapid a rate of decomposition also results in "blowing" of the compounded stock since the volatile peroxide decomposition products cannot diffuse to the surface of the stock as rapidly as they are formed.

For benzoyl peroxide stocks, the recommended curing conditions are 30 minutes at 230°F. for the initial or molding stage. This is followed by an after-cure which

TABLE II—COMPARISON OF THE CURING SYSTEMS FOR KEL-F ELASTOMER

Curative Type	Per-oxide	Amine	MDI	MDI-Amine	
Stock Number	61	37	1	99	98
Compound:					
Kel-F Elastomer	100	100	100	100	100
Zinc Oxide	10	5	5	5	5
Benzoyl Peroxide	3	—	—	—	—
MDI-100	—	—	5	5	5
TEPA	—	6	—	—	1
Trimene Base	—	—	—	3	—
Press Cure:					
Time (hours)	½	1	1	1	1
Temperature (°F.)	230	260	260	260	260
Oven Cure:					
Time (hours)	16	1	72	16	16
Temperature (°F.)	300	300	212	212	212
Physical Properties					
After Press Cure:					
Stress at 300% E (psi)	200	530	400	760	—
Tensile Strength (psi)	350	1280	530	1590	—
Per cent Elongation	750	600	350	400	—
Hardness (Shore A)	40	48	53	50	—
After Oven Cure:					
Stress at 300% E (psi)	530	1020	590	1170	630
Tensile Strength (psi)	1350	1620	800	1460	1250
Per cent Elongation	500	450	320	400	580
Hardness (Shore A)	47	55	61	58	60
Tear Strength (ppi)	—	—	43	53	—

TABLE III— EFFECT OF METAL OXIDE VARIATION AND BASIC LEAD SALTS ON PEROXIDE-CURED KEL-F ELASTOMER

Stock Number	61	89	108	109	110	111
Compound:						
Kel-F Elastomer	100	100	100	100	100	100
Zinc Oxide	10	10	—	—	10	10
Litharge	—	—	10	—	—	—
Calcium Oxide	—	—	—	10	—	—
Benzoyl Peroxide	3	3	3	3	3	3
Dyphos	—	10	10	10	—	—
Tribase	—	—	—	—	10	—
Tri-Mal	—	—	—	—	—	10
Press Cure:						
Time (hours)	½	½	½	½	½	½
Temperature (°F.)	230	230	230	230	230	230
Oven Cure:						
Time (hours)	16	16	16	16	16	16
Temperature (°F.)	300	300	300	300	300	300
Physical Properties						
After Press Cure:						
Stress at 300% E (psi)	200	450	340	380	505	375
Tensile Strength (psi)	350	920	640	715	1040	690
Per cent Elongation	750	450	600	550	450	500
Hardness (Shore A)	40	45	42	45	47	42
After Oven Cure:						
Stress at 300% E (psi)	530	660	435	760	685	490
Tensile Strength (psi)	1350	2500	2200	2180	2120	2400
Per cent Elongation	500	500	650	475	500	550
Hardness (Shore A)	47	51	48	47	52	47
Tear Strength (ppi)	—	123	141	—	—	—

can be conveniently carried out in the oven at 300°F. The length of the after-cure is largely determined by the thickness of the rubber cross-section. The after-cure cycles required for development of the optimum cure at various thicknesses are:

Cross Section Thickness (mils)	Oven Cure (Hours)
10	1
35	5
75	8
>75	16

To preclude "blowing" or "out-gassing" in molded items having thicknesses greater than 75 mils, it is advisable to lower the peroxide concentration to 1.5 parts per 100 parts of rubber. This reduction in peroxide does not appreciably change the physical properties of the stock. An example of such a compound is our Compound 72 containing 10 parts of zinc oxide, 10 parts of Dyphos, and 1.5 parts of benzoyl peroxide per 100 parts of Kel-F Elastomer gum.

Peroxide stocks are smooth, pliable, soft, easily processed, and flow well in the mold. These stocks, when cured, have excellent physical properties and maximum resistance to oxidative chemical attack.

Amine Vulcanization: Strongly basic, primary and secondary aliphatic polyamines are effective in curing Kel-F Elastomer. Of the amines tested, triethylene tetramine (TETA), tetraethylene pentamine (TEPA), Trimene Base, and hexamethylene diamine (HMDA) impart the highest tensile strengths. The optimum amine concentrations are 1½ to 6 parts of amine per 100 parts of gum. The fresh tensiles of amine stocks vary directly with the amine concentration; however, high amine loadings give stocks that tend to become short after prolonged high temperature aging.

Amine stocks tend to scorch when processed on a hot mill; however, scorching can be controlled by introducing the amine in the form of an amine salt, such as hexamethylene diamine diacetate. Amine stocks can be cured in a shorter period than other stocks. The recommended curing cycle is one hour in the press at 260°F. followed by a one hour after-cure in the oven at 300°F.

The primary advantage of amine stocks is that, unlike the peroxide stocks, they can be plasticized effectively with commercial plasticizers. Preliminary examination of plasticized amine stocks has shown that these stocks are more resilient and have better compression set and low temperature properties than other Kel-F Elastomer stocks.

Isocyanate Vulcanization: Kel-F Elastomer has been vulcanized with a variety of polyisocyanates such as di-(4-phenyl isocyanate) methane (MDI), toluene 2,4-diisocyanate (TDI), and tri-(4-phenyl isocyanate) methane. Metal oxides are required to accelerate this type of cure. Concentrations of 5 to 10 parts of isocyanate and 5 to 10 parts of metal oxide per 100 parts of rubber are preferred.

A forming cure of one hour at 260°F. should be followed by an after-cure of 32 to 72 hours at 212°F. Under these conditions, the initial tensile strengths of isocyanate vulcanizates are low but tend to improve on aging. In general, isocyanate-cured stocks are stiffer, shorter, and less acid resistant than peroxide-cured stocks. Work in progress indicates that isocyanate stocks may improve the adhesion of the polymer to both fabric and metal substrates.

To improve the rate and extent of isocyanate vulcanization, from 1 to 3 parts of various amines, such as Trimene Base and TEPA, have been added to stocks containing five parts of polyisocyanate. Although these stocks, like the straight isocyanate stocks, are stiffer and less acid resistant than peroxide vulcanizates they do offer good resistance to aromatic fuels.

TABLE IV—COMPARISON BETWEEN FILLED AND UNFILLED KEL-F ELASTOMER VULCANIZATES

Stock Number	Q-28	Q-70	Q-73	89	119	122
Compound:						
Kel-F Elastomer	100	100	100	100	100	100
Zinc Oxide	5	5	5	10	10	10
MDI-100	5	5	5	—	—	—
TETA	1	1	1	—	—	—
Benzoyl Peroxide	—	—	—	3	3	3
Dyphos	—	—	—	10	10	10
Hi-Sil-202	—	20	—	—	20	—
Silicone Coated Hi-Sil-202	—	—	20	—	—	20
Press Cure:						
Time (hours)	1	1	1	½	½	½
Temperature (°F.)	260	260	260	230	230	230
Oven Cure:						
Time (hours)	16	16	16	16	16	16
Temperature (°F.)	212	212	212	300	300	300
Physical Properties						
Stress at 300% E (psi)	1350	2200	2500	660	1230	1620
Tensile Strength (psi)	1700	2400	2500	2000	1880	3600
Per cent Elongation	300	330	310	500	525	450
Hardness (Shore A)	55	78	77	48	70	73
Tear Strength (ppi)	—	135	160	123	—	204

TABLE V—PHYSICAL PROPERTIES OF A GROUP OF FILLED PEROXIDE-CURED KEL-F ELASTOMER STOCKS

(Cure: Press—½ hr. @ 230°F.; Oven—16 hrs. @ 300°F.)

Stock Number	119	122	183	160	166
Kel-F Elastomer	100	100	100	100	100
Zinc Oxide	10	10	10	10	10
Dibasic Lead Phosphite	10	10	10	10	10
Benzoyl Peroxide	3	3	3	3	3
Hi-Sil-C	20	—	—	—	—
Silicone-Coated Hi-Sil-C (LM-3)	—	20	—	—	—
Hi-Sil X-303	—	—	20	—	—
Zirconium Silicate	—	—	—	20	—
Philblack-A	—	—	—	—	20
Physical Properties					
Stress at 300% (psi)	1230	1620	1200	800	290
Tensile (psi)	1880	3600	2700	2510	420
Elongation (%)	525	450	660	700	450
Hardness (Shore A)	70	73	75	60	69

Compounding Ingredients

Fillers: Although Kel-F Elastomer gum vulcanizates are characterized by high tensile strength and good extensibility, these properties may be improved by the incorporation of selected fillers. The effects of adding two such fillers to peroxide and MDI-amine compounds are shown in Table IV.

In general, precipitated silicas such as Hi-Sil-202 increase the modulus and hardness without appreciably affecting the ultimate tensile strength or elongation of the peroxide-cured stocks. The same filler, Hi-Sil-202, coated with linear silicone polymers markedly increases both the tensile strength and tear strength of peroxide

TABLE VI—CHEMICAL RESISTANCE OF KEL-F ELASTOMER PEROXIDE-CURED STOCK NUMBER 89

Immersion Time	Per Cent Volume Swell, 70°F. 1 Day	2 Days	27 Days
Acids			
White Fuming Nitric Acid	12	22	24
Red Fuming Nitric Acid	9	15	24
Fuming Sulfuric Acid	0	0	1
12M Hydrochloric Acid	3	3	16
Solvents			
Petroleum Ether	5	5	13
Cyclohexanone	700+	—	—
Aniline	0	1	5
Ethyl Alcohol	2	2	6
Furfuryl Alcohol	2	2	4
Toluene	40	60	58
O-dichlorobenzene	9	14	30
Water	0	0	0
30% Sodium Hydroxide	3	2	2
Carbon Tetrachloride	16	30 [a]	33 [b]
Chloroform	30	60	52
Turpentine	0	0.5	1.5
Fuels and Lubricants			
JP-3	1	2	5
Isooctane	2	2	2
Isooctane/Toluene 70/30	4.5	7	16
ASTM Oil No. 1	0	0	0
ASTM Oil No. 2	1	1	0
ASTM Oil No. 3	1	1	0
Elco Lube 28	0	0	0
Texamatic 1505	1	0	1
Turbo Oil 15	16	24	600
Miscellaneous			
Titanium Tetrachloride	1	3	7
Liquid Chlorine	95	100	—
Chlorine Gas (1 atm.)	1.5	1.5 [c]	—
Silicone Oil DC-200	0	1	0
Bleach Solution	1	1	0.5
Chloro Wax 40	1	1.5	1.5
Freon 113	180	—	—

(a) Three days immersion. (b) Six days immersion. (c) Seven days immersion.

vulcanizates without changing elongation. It is theorized that this high reinforcement results from cross-linking the silicone polymer to the fluorocarbon polymer. To date, it has not been possible to verify or disprove this theory.

The physical properties observed for a group of filled peroxide-cured stocks are shown in Table V. The fillers include three silicas, a metal silicate and a furnace black. Again, the silicone-coated Hi-Sil-202 shows the greatest reinforcement in tensile strength. A highly refined silica, Hi-Sil-303, has been shown to reinforce Kel-F Elastomer, and the resultant filled stock, as indicated by Stock No. 183, shows excellent retention of physical properties after aging at 400°F. To date, we have not had success in using carbon black in stocks cured with benzoyl peroxide.

Softeners: Current data show that commercial plasticizers such as Hercoflex-600, Flexol 400, and di-isooctyl sebacate function as primary plasticizers in amine and amine-isocyanate stocks. These stocks are softer, more resilient, and have better low temperature and compression set properties than unplasticized stocks. Incorporation of these plasticizers in peroxide compounds results in severe "blowing" of the stock during cure. Low molecular weight polyisobutylene, such as Vistanex L.M.-M.S., and Kel-F oils are compatible in peroxide compounds and produce stocks which are softer and tackier and have good tensile properties.

Blends: Kel-F Elastomer is compatible over a wide range and can be vulcanized with Hevea, GR-S, GR-N, neoprene, Butyl, Hypalon, and silicone rubbers. These blends have not been fully explored, but preliminary data indicate that blending with Kel-F Elastomer will enhance the chemical resistance of these rubbers.

Properties of Vulcanizates

Physical Properties: The principal physical properties of Kel-F Elastomer vulcanizates are summarized in Tables II and III. Among the chemical and heat resistant rubbers, the new polymer is notable for its high tensile strength (2000 to 3500 psi), good extensibility (400 to 600 per cent) and good tear strength (150 to 400 ppi). Compression set measurements of vulcanizates show values as low as 5 per cent at 77°F. and 30 per cent at 212°F.

Chemical Resistance: Kel-F Elastomer has excellent resistance to strong oxidizing mineral acids, peroxides, alkalies, titanium tetrachloride, alcohols, aliphatic solvents, some chlorinated solvents, hydraulic fluids, silicone oils, and sulfur-bearing extreme pressure lubricants. The resistance of a typical peroxide-cured stock to a variety of chemicals is shown in Table VI.

The polymer will withstand immersion in white fuming nitric acid for an extended period. Tests show that these stocks reach an equilibrium volume swell of 20 to 30 per cent in one week. During this period, extensibility and hardness remain virtually unchanged, although there is a noticeable decrease in tensile strength. Under equivalent conditions, all other available rubbers will disintegrate within a matter of minutes or even seconds. The effects on the physical properties of immersion in fuming nitric acid and several other chemicals are shown in Figure 1.

The effect of hot oils on a peroxide vulcanizate is shown in Table VII. These data are quite typical of the resistance of this elastomer to oils of this type. As discussed above, it is soluble in esters. This solubility is reflected in the fact that vulcanizates are quite swollen by diester type lubricants, as shown in Table VI.

Kel-F Elastomer gum and vulcanizates are highly swollen by the Freons and other low molecular weight fluorocarbons. Like the esters, these media swell but do not chemically attack the polymer. Conversely, anhydrous hydrazine, representing an extreme case of amine vulcanization, reacts vigorously with the polymer, resulting in embrittlement.

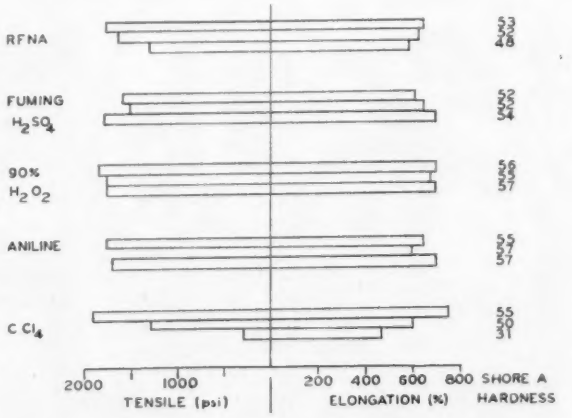

FIG. 1—Chemical resistance of peroxide-cured Kel-F Elastomer. (0, 20 and 70 hours immersion at 70°F.).

TABLE VII—EFFECT OF HOT OILS ON A PEROXIDE VULCANIZATE

Media	ASTM No. 1 Oil	Texamatic 1505 Oil
Original Physical Properties		
Tensile Strength (psi)	1700	1700
Per cent Elongation	630	630
Hardness (Shore A)	56	56
Physical Properties After 70 Hours Immersion at 300°F.		
% Change in Tensile Strength	+15.5	—5
% Change in Elongation	+25	+22
Change in Hardness (Shore A units)	0	—2
% Volume Swell	0	+5

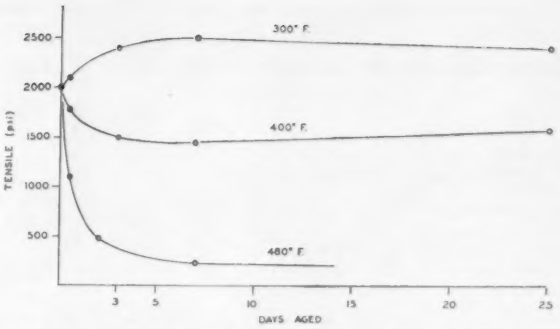

FIG. 3—Thermal stability of peroxide-cured Kel-F Elastomer.

Thermal Stability: Figures 2 and 3 show the excellent thermal stability of the elastomer. The data show that Kel-F Elastomer vulcanized with either peroxides or isocyanates retains good physical properties after prolonged aging at temperatures up to 400°F. There are indications that intermittent service can be expected at temperatures up to 480°F.

In addition to its thermal stability in air, Compound 89 has superior resistance to high pressure steam. The following data were obtained after exposing this compound to steam at 400°F. and 247 psia:

Exposure Time	Original	1 day	7 days
Tensile Strength (psi)	1860	1060	1165
Per Cent Elongation	590	620	690
Hardness (Shore A)	51	42	42
Per Cent Volume Swell	——	16	22

Electrical Properties: The electrical properties are similar to those of most vinyls. These properties are shown in Table VIII. It is important to note that the values obtained are not markedly changed when the stock is conditioned for one week in 95% relative humidity at 77°F.

Water Absorption: As suggested by the above electrical measurements, the water absorption of both gum and vulcanizate is extremely low. Measurements comparing the water absorption characteristics of a standard Kel-F Elastomer with other rubbers are shown in Table IX.

Low Temperature Properties: In contrast with its excellent heat resistance, Kel-F Elastomer has a relatively low brittle point of −60°F. The following Gehman stiffness data typify the low temperature performance of an 89 compound and indicate the improvement that is possible using an experimental, plasticized amine stock:

Gehman Stiffness	89 Compound (°C.)	Plasticized Amine Compound (°C.)
T_2	1.5	—24
T_5	—2.3	—27
T_{10}	—4.5	—29
T_{100}	—17.0	——

Although it is not an arctic rubber, continued research should improve the low temperature properties.

Additional Properties: The excellent resistance of Kel-F Elastomer to the normal elements of weathering are summarized in Table X. Because of its high fluorine content, it does not support combustion. Coatings applied to flammable fabrics render them self-extinguishing. Preliminary air diffusion measurements show that the elastomer is on a par with Butyl rubbers.

From the standpoint of toxicity, the polymer has been cleared by the Surgeon General's Office, Department of the Army, for use in outer garments. Extensive tests have shown that it is also resistant to attack by microorganisms.

Methods of Fabrication

Although this phase in the development of Kel-F Elastomer is still in its infancy, there has been suffi-

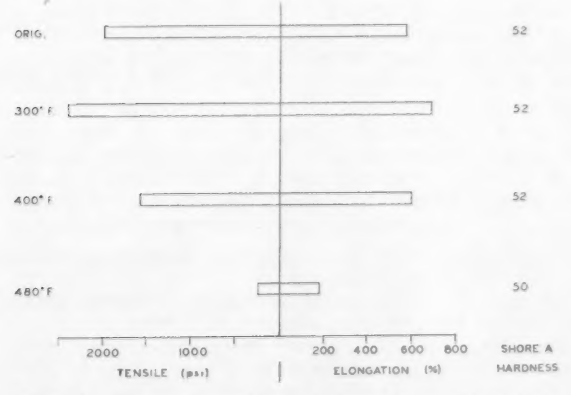

FIG. 2—Thermal stability of peroxide-cured Kel-F Elastomer. (30 days in circulating air oven).

TABLE VIII—ELECTRICAL PROPERTIES OF KEL-F ELASTOMER PEROXIDE-CURED STOCK NUMBER 122

Test	Original Stock	Conditioned Stock
Dielectric Strength (Short Time) Volts/mil Average	613	642
Dielectric Strength (Step-by-Step) Volts/mil Average	521	553
Volume Resistivity Ohm-centimeter	1.13×10^{14}	1.21×10^{14}
Dielectric Constant		
60 cycles	6.27	6.52
1000 cycles	5.90	6.08
10^6 cycles	3.94	4.05
Power Factor		
60 cycles	0.025	0.028
1000 cycles	0.053	0.057
10^6 cycles	0.113	0.120

TABLE IX—WATER ABSORPTION PROPERTIES OF VARIOUS RUBBERS

Rubber	Days	Mg./in.², 77°F.
Smoked Sheet	55	12.32
Neoprene	58	12.90
Deproteinized Rubber	63	6.38
GR-S (elect. grade)	63	6.02
GR-A	63	13.55
Chlorosulfonated Polyethylene	63	5.09
Kel-F Elastomer (89)	65	3.50

cient progress to warrant a review of those methods employed in fabrication. Unless so stated, the following information refers to the peroxy-cured recipes as exemplified by Stock Nos. 89, 72 and the filled 122 previously discussed.

Molding: Compression molding into a variety of shapes has been accomplished successfully using standard equipment. Flat sheets are formed by charging the mold with a sheeted stock having sufficient thickness to maintain compression. The quantity charged is calculated from the known volume of the cavity and the specific gravity of 2.0 for the compounded stock. The stock is press-cured at 230°F. and 200 to 500 psig for one-half hour. Any common wetting agent, such as the alkyl aryl sulfonates, may be used as a mold release.

The press-cured sheet is removed from the mold and given a longer after-cure at 300°F. to attain its maximum strength. The extent of the after-cure is dependent upon diffusion of heat to the interior of the stock and is therefore a function of thickness. For thin sections, one hour is sufficient, whereas large cross sections may require four to five hours. The weight loss during the high temperature oven cure is less than 1%, and the linear shrinkage is less than 2%.

Along with the diffusion of heat into the sheet during the after-cure, there is strong evidence that small quantities of by-products from the peroxy decomposition diffuse to the surface and are vaporized. The diffusion rates are low as evidenced by the poor solubility of the polymer in aromatics. Entrapment of these products within the rubber during the after-cure results in outgassing and bubble formation. These phenomena can be controlled by lowering the amount of benzoyl peroxide as the thickness of the molded section increases. Sections one-half inch in thickness can be cured without gassing by reducing the amount of benzoyl peroxide from 3.0 to 1.5 parts per hundred of elastomer. Such a stock is Compound 72 previously discussed under vulcanization.

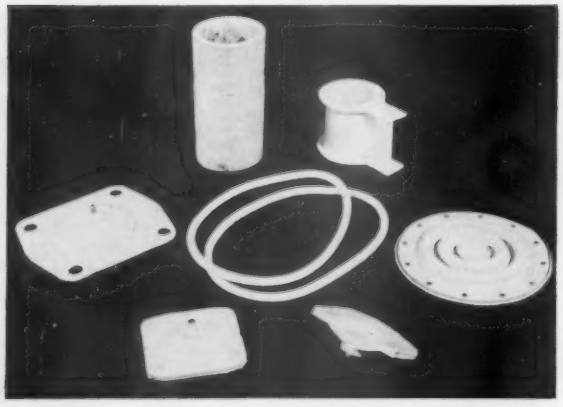

FIG. 4—Typical Kel-F Elastomer articles made by compression molding.

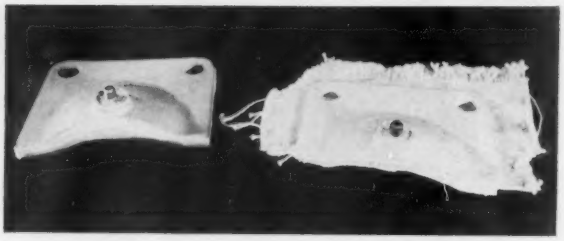

FIG. 5—Close-up of a valve diaphragm built up with alternating sheets of Kel-F Elastomer and reinforcement.

Figure 4 shows various types of articles fabricated by compression molding. These include sheets, O-rings, shaft seals, button seals, unsupported and reinforced diaphragms, and grommets for electrical connectors. Figure 5 shows a close-up of a valve diaphragm which has been built up with alternating sheets of Kel-F Elastomer and reinforcement. The elimination of air pockets during the molding operation was accomplished by allowing the stock to heat to 230°F. and flow under little or no applied pressure. The geometry of the built-up sections governs the positions of the reinforcing material and establishes the direction of flow of stock which in this example must be from the center insert section outward. In such sections it was necessary to use low levels of benzoyl peroxide to prevent out-gassing during the cure. O-rings of various sizes ranging from ½ to 6 inch I.D. have been compression molded without difficulty. Either preforms cut from sheeted stock or extruded beading may be used in this operation.

Extruding: Kel-F Elastomer has been extruded into tubing, solid beading, and over small conductors. More data are required to establish optimum conditions and rates. However, a few fundamental principles are involved which require attention. The elastomer appears to have a transition point not fully understood thermodynamically between 170° and 190°F. This transition is characterized by a change from the elastic to an inelastic or powdery state. This effect has been noticed during milling at these temperatures, and for this reason it is desirable to add the curatives during compounding at temperatures well below this range.

Equally important is the recognition of such a transition temperature during extrusion. The temperature of the barrel should be maintained at 120° to 130°F. and

TABLE X—AGING CHARACTERISTICS OF PEROXIDE-CURED KEL-F ELASTOMER

Oxygen Bomb:	No change in physicals or appearance; 7 days, 300 psig., 75°C.
Ozone:	No change in physicals; no surface defects; 6 hours, 130 ppm., 30% stretch.
Ultraviolet:	Slight increase in tensile, no change in elongation or hardness; 100 hours, Atlas Fadometer.
Weathering:	No change in physicals; one year outdoor exposure, industrial atmosphere.

the die at 140° to 150°F. Above the critical temperatures one may expect the surface of the exudate to be covered with fibrous-like powder, showing a lack of consolidation of the stock during its passage through the die. No special die design is required, although the use of long lands, ¼ to ½ inch, is recommended for maximum surface polish. No screens or breaker plates are required. The exudate having been oriented possesses reasonable strength in the machine direction and may be wound up on a reel or handled without difficulty.

Since the stock has been formed at low temperatures and high pressures, the cure cycle including the decomposition of the peroxy curing agent must take place following the forming operation. Tight cures have been effected by using open steam at 15 to 20 psig for 10 minutes followed by an after-cure at 300°F. The possibilities of using open steam continuous vulcanization equipment appears promising. In lieu of open steam curing, a 20 to 24 hour cure at 185°F. may be used. This should also be followed by an after-cure at 300°F. The preferred level of benzoyl peroxide is again dependent upon wall thickness so as to eliminate gas formation during the curing cycle.

Figure 6 shows a typical extrusion of ¼-inch tubing being carried out in a bench-sized 1-inch extruder. Figure 7 shows coils of ¼-inch and ⅜-inch extruded tubing.

Calendering: Calendering of peroxide-cured stocks on a 21 x 36 inch inverted "L" calender has produced satisfactory sheets from .015 to .035 inch in thickness. Efforts to skim coat cotton fabric with the calendered sheet were unsuccessful due to poor adhesion of the stock. More formulation is necessary to prepare skim-coat and friction-coat recipes in which consideration must be given to improve the flow of the stock into the interstices of the fabric. Figure 8 shows an example of a calendered sheet .030 inch in thickness. Next to this sheet is a section of hose built up from calendered isocyanate stock freshened with tetrahydrofuran solvent, then cured by tightly wrapping the section with fabric and subjecting the assembly to open steam, 15 psig, for one-half hour. The individual sheets of rubber are so tightly bonded that it is difficult to distinguish the interfaces between concentric layers.

Other Methods: Since Kel-F Elastomer is soluble in selected ketones, ethers and esters, it is readily adaptable to cement formulation. Mixed solvent systems have been used in which a balance between solvency, boiling range and viscosity was determined. Such a system is seen in Table XI. In this formulation, the MIBK and amyl acetate serve as true solvents, while the toluene and n-butanol are diluents added to lower the viscosity. Cements having a solids content of 25% and a viscosity of 45,000 centipoises have been applied to various fabrics including cotton, nylon, Dacron, Orlon and fiber glass. Spreading techniques include the use of the spreading knife in contact with the fabric at a point in contact with the supporting roll, or at a point between supporting rolls.

Strong films may be readily cast from solution. Thin unsupported films cast onto glass plates and cured at 300°F. for five hours showed tensile strengths of 2500 psi and elongations of 400 to 500 per cent. Gloves are produced by dipping forms into Kel-F Elastomer cements. The shelf life for cements containing benzoyl peroxide is limited to one month due to chemical inter-

IDENTIFICATION OF MATERIALS

Trade Name	Material	Supplier or Trade Mark Owner
A.S.T.M. Oil No. 1	see A.S.T.M. D471-52T	Enjay Company, Inc.
A.S.T.M. Oil No. 2	see A.S.T.M. D471-52T	Sun Oil Company
A.S.T.M. Oil No. 3	see A.S.T.M. D471-52T	Sun Oil Company
Dacron	polyester fiber	E. I. du Pont de Nemours & Co.
Dynel	acrylic fiber	Carbide & Carbon Chemicals Co.
Dyphos	dibasic lead phosphite	National Lead Co.
Elco Lube 28	extreme pressure lubricant	Elco Lubricant Corp.
Flexol 4GO	plasticizer	Carbide & Carbon Chemicals Co.
Hercoflex-600	plasticizer	Hercules Powder Company
Hi-Sil-202	precipitated silica	Columbia-Southern Chemical Co.
Hi-Sil-303	refined silica	Columbia-Southern Chemical Co.
Hypalon	chlorosulfonated polyethylene	E. I. du Pont de Nemours & Co.
JP-3	hydrocarbon fuel	Many suppliers
Kel-F Oils	chlorofluorocarbon oils	M. W. Kellogg Company
MDI-100	di-(4-phenyl isocyanate) methane	Monsanto Chemical Co.
Neoprene	polychloroprene	E. I. du Pont de Nemours & Co.
Orlon	polyacrylonitrile fiber	E. I. du Pont de Nemours & Co.
Silicone-coated Hi-Sil-202	experimental filler L.M. 3	Linde Air Products Co.
TEPA	tetraethylene pentamine	Carbide & Carbon Chemicals Co.
TETA	triethylene tetramine	Carbide & Carbon Chemicals Co.
Texamatic 1505	extreme pressure lubricant	Texas Company
Tribase	tribasic lead sulfate	National Lead Co.
Tri-Mal	tribasic lead maleate	National Lead Co.
Trimene Base	a cyclic secondary amine	Naugatuck Chemical
Turbo Oil 15	a diester lubricant	Esso Standard Oil Co.
Vistanex L.M.-M.S.	polyisobutylene	Enjay Company, Inc.

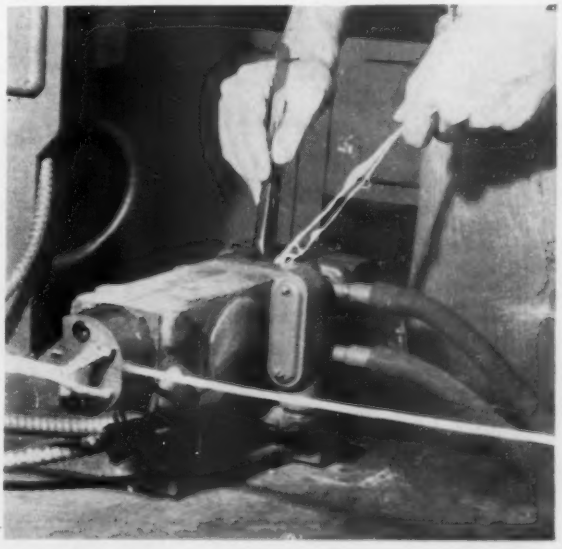

FIG. 6—Typical extrusion of ¼-inch tubing of Kel-F Elastomer on small-size extruder.

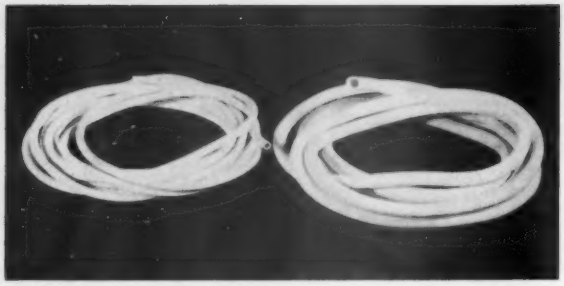

FIG. 7—Coils of ¼-inch and ⅜-inch extruded tubing of Kel-F Elastomer.

actions between the solvents and the peroxy curative. It is recommended that the curative be added as a solution in toluene prior to use.

A water dispersion or latex of the elastomer is prepared at present only in low solids content, that is, 10 to 15% by weight. However, work in progress indicates that it may be possible to produce higher solids latices suitable for spread and dip coatings.

Applications

Many of the end item performance tests are in progress, and the available data are based upon tests of relatively short duration. It is important that this limitation be kept in mind during any discussion of the applications of Kel-F Elastomer.

O-rings have been evaluated in functional tests in contact with WFNA at temperatures extending from −65° to 160°F. At low temperatures, both the hardness and stiffness increased significantly. However, dynamic seals were attainable, and no fracture due to embrittlement occurred over a period of one week. After a similar period at 160°F., seals against WFNA were intact and the elastomer retained its strength and flexibility. No other elastomers tested have shown similar resistance to strong oxidants.

Diaphragms are being tested for fatigue and stress cracking. To date, their performance has been excellent with one test group reporting that a 2-inch unreinforced diaphragm, having a thickness of 5/16 inch, was flexed 16,500 cycles and is in good working order. A compression set of only 10% was noted for a thin diaphragm (.080 inch) which operated successfully against 80 psig of water for 140,000 cycles.

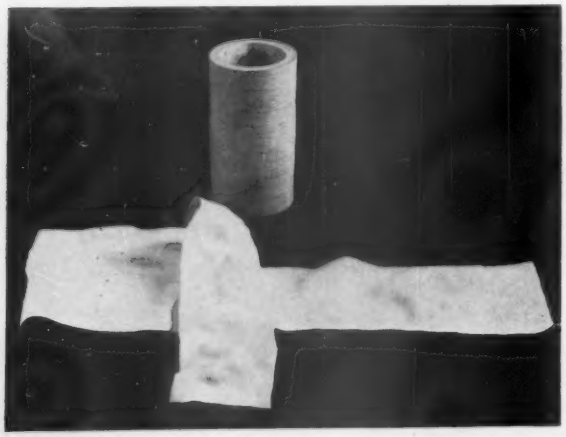

FIG. 8—Example of a Kel-F Elastomer calendered sheet .030 inch in thickness.

TABLE XI—KEL-F ELASTOMER CEMENT FOR SPREAD COATING

Solids (25%)	
Kel-F Elastomer	100
Zinc Oxide	10
Dyphos	10
Benzoyl Peroxide	3
Solvents	
Methyl isobutyl ketone	30
Amyl Acetate	30
Toluene	10
n-Butanol	30

Inserts in fuel buttons have been cycled 5000 times closing against 500 psig water pressure with sealing occurring each time. Gasket material cut from sheets have sealed sections of glass pipe containing WFNA. Performance has been satisfactory over a six-month period.

Rigid requirements are being specified by the military services for protective clothing for personnel handling oxidant type fuels, such as WFNA, as well as fuel cells and hose to handle, supply, and transfer these fluids.

A .003-inch coating of the rubber spread onto a fabric from cement produced a coated fabric having an electrical resistivity of 7 x 10^4 megohms at 500 volts. The same fabric tested in the NARTS type H-cells was impermeable to WFNA for over 40 hours. Similar samples have withstood RFNA for as long as 165 hours. These values become more meaningful when compared with the best of conventional coatings which fail and even disintegrate in a matter of minutes.

Another rather interesting result was that reported for the abrasion resistance of a .007-inch film spread onto cotton airplane cloth. Using a Taber H-22 wheel (maximum abrasive) and 1000 gm. load (maximum load), 6000 cycles were completed at which time the coating was still intact.

If we were to select fields of application for Kel-F Elastomer at the present state of development, we would consider those requiring the following:

1. Extreme resistance to oxidants such as white fuming nitric acid (propellant grade), red fuming nitric acid (propellant grade), oleum, 90% H_2O_2, and ozone, oxygen, and weather.
2. Thermal stability up to 400°F.
3. Chemical resistance to oils at high temperature, excluding diester types but including sour crudes, sulfur-bearing EP lubricants, silicones, and hydraulic fluids such as polyalkylene glycols or fluids conforming to military specifications MIL-G-5606 or MLO-8200.
4. Applications requiring very low moisture absorption, including electrical insulation.

Examples of end items fabricated from Kel-F Elastomer to meet such specifications include: hose, tubing, diaphragms, gaskets, O-rings, and seals; tank linings and fuel cells; acid-resistant boots, gloves, and clothing; corrosion-resistant paints and sealants.

There are many other fields of application which will become evident as our knowledge of and experience with this polymer develops.

ACKNOWLEDGMENT

The authors would like to express their thanks to Mr. C. B. Griffis and Dr. J. C. Montermoso for their interest in Kel-F Elastomer and their contributions to the research which led to this article.

Tensile Strength Testing of Spray-Formed and Cast Vinyl Films

Part I—Preliminary Analyses

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This report summarizes the progress to date of an investigation initiated to evaluate the tensile strength testing of spray-formed vinyl films, and to determine the sources of inherent errors. The investigation presently concerns analysis of data accumulated from tensile specimens obtained from films prepared by one operator, and tested in one laboratory.

The preparation and tensile strength testing of vinyl films of six formulations are described. A comparison of the tensile strength values of spray-formed and cast films indicates that the reproducibility of the cast films is no better than thtat of the spray-formed films.

It is shown that the dispersion of the tensile strength means of vinyl films of a given formulation, both spray-formed and cast, is far greater than the theoretical dispersion calculated from the standard deviation of a single specimen. This condition indicates the existence of extraneous factors which affect the tensile strength values between the films, and which can be compensated for by a method of sampling described herein.

The tensile strength of a specimen is correlated with its density, and it is shown that a curvilinear regression of the second order affords a better fit to the data than a first-order regression. Some of the variation of tensile strengths of spray-formed films of a particular formulation, within and between laboratories, is caused by the variation of density between films. The variation of density results from bubbles within the film.

Tensile strength is correlated with "tensile index," and the relationship is found to be linear within the values obtained. Tensile index is less prone to experimental error than tensile strength, and may be of definite value in conjunction with tensile strength in acceptance testing of vinyl solutions for ordnance use.

The effect of wet to dry spray techniques on the tensile strength of spray-formed films was investigated, and it is shown that tensile strengths and densities increase up to a certain point as the spray technique is altered from wet to dry. Optimum smoothness of a film is obtained by using a wet-spray technique. Maximum tensile strengths and densities are obtained with cast films. Other interesting conclusions are recorded.

VARIATIONS in tensile strength value of elastomers have been recognized for a long time by the rubber industry, and numerous investigators have endeavored to explain these variations on a statistical basis *(1-9)*. A similar situation has been recognized by this Laboratory during the past few years relative to tensile strength results obtained with spray-formed vinyl films.

Principally, the tensile testing methods in general use by the industry are based on standards established by the American Society for Testing Materials. The method used at this Arsenal is a modification of the ASTM method (see Appendix I) and is described in Section 5d of Federal Specification ZZ-R-601a (see Appendix II).

It has been the experience of this Laboratory that spray-formed vinyl films, prepared from the same solution either by different individuals, or under slightly different conditions—i. e., slightly different spray-gun settings, and slightly different tank and atomizing pressures—give varying tensile strength results. Consequently, a program was undertaken in an effort to arrive at some conclusions regarding the variations in tensile strength results. The program embodied the following phases of investigation: (1) The uniformity of test results of spray-formed films as compared to those of cast films; (2) A possible relationship between tensile strength and film density; (3) The effect of varying degrees of wet to dry spray techniques in preparing the films; (4) The determination and evaluation of sources of error in the tensile strength determinations.

Results obtained in the tensile strength method and in the tensile index method* of testing which involves the weight of the specimen were compared to determine which method would be more reliably applicable to the evaluation of the strength of vinyl films. Several plots of data were made to determine if any correlation of the methods could be found. This present report is based on data obtained from films prepared by one operator.

Testing Procedure

Samples of vinyl solutions, hereinafter referred to as solutions A, B, C and D, were obtained from manufacturers on the Ordnance list of approved suppliers. Two different vinyl solutions, hereinafter referred to as solutions E and F, were prepared at this Laboratory.

From each of solutions A and B, enough spray-formed and cast films were prepared so that 300 specimens of each type would be available for tensile testing. This required approximately 10 spray-formed and 18 cast films. An effort was made to prepare films 0.035 of an inch in thickness.

The spray-formed vinyl films were prepared by spraying on clean glass plates (15 in. x 24 in.), around the edges of which an adhesive (Pliobond 20) had been applied to prevent shrinkage of the film while drying. The films were then air-dried in a draft-free location for 24

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* Tensile index $= \frac{WC}{L}$,

where W = weight of specimen in grams,

$C = \frac{144}{\text{surface area of one side of specimen in sq. in.}} = \frac{144}{4.488} = 32.09$, and

L = pounds load at break.

TABLE I—SPRAY GUN SETTINGS

(For Binks Model 18 Spray Gun with Quart Size Pressure Cup with Regulator and No. 67P Nozzle)

Spray Application	Nozzle Pressure (lbs.)	Cup Pressure (lbs.)	Air-Orifice Setting (turns out)	Volume of Solution per Sheet * (qts.)
Very Dry Spray (I)	80	5	¾	2
Dry Spray (II)	70	7	1¾	2
Wet Spray (III)	65	10	3	2¼
Very Wet Spray (IV)	60	15	4¼	2½

* Sheet size = 15 in. x 24 in. x 0.035 (± 0.005) in.

hours, cut from the glass plates, and conditioned for 24 hours more at 60°C. The cast films were prepared by pouring measured quantities (ca. 520 cc) of the vinyl solution (ca. 23% solids) onto glass plates with wooden frames (10 in. x 18 in.). Pliobond 20 was applied to the sides of the wooden frames to prevent film shrinkage during drying. The films were air-dried in the trays for 48 hours, cut out, and conditioned 24 hours more at 60°C. Care was exercised in preparing the films so that they were as free of bubbles as possible.

From each of solutions C and D, two films were spray-formed on glass plates in each of the following ways of application: (1) Very dry, (2) Dry, (3) Wet, and (4) Very wet. The spray-gun settings are listed in Table I. Additional films were prepared from each solution by casting. The prepared films were dried and conditioned as previously described.

Five batches of each of solutions E and F were prepared. From each batch, two films were spray-formed. The films were sprayed very wet to obtain optimum surface smoothness. The films were conditioned as previously described for spray-formed films.

From the conditioned vinyl films described above, dumbbell-shaped tensile specimens were cut as shown diagramatically in Section 5b of Federal Specification ZZ-R-601a (see Appendix II). Each specimen was weighed on an analytical balance to the nearest 0.1 mg, and was gauged for maximum and minimum thickness (through the narrow section) using a Randall-Stickney gauge with a ¼-in.-diameter foot and a 3-oz. dead weight, as described in Section 1c of Specification ZZ-R-601a (see Appendix II). In calculating the tensile strength, the minimum thickness value was used, and in computing the density, the average thickness value was used. The specimens were placed in an air-conditioned room (77°F., 50% RH) for 24 hours, after which the tensile strength of each specimen was determined by the method described in Section 5d of Federal Specification ZZ-R-601a (see Appendix II).

From the weight and calculated volume, the density of each specimen was determined. The tensile strength values and the densities of the specimens from each film were averaged, and the standard deviations determined.

In the analysis of the test results, nowhere were any individual results discarded, although an occasional result was farther from the mean than would normally be expected. It has, as yet, not been conclusively proved that low results are due to faults in testing rather than to flaws occurring in the film during preparation. The retention of the extreme values resulted in higher standard deviations with no change in the conclusions drawn.

Throughout this investigation, the width of the specimens was assumed constant, since only one tensile specimen die was used. Newton *(4)* reports that correction for errors in the assumed width of rubber specimens does not measurably increase the accuracy of the determinations.

A correlation of tensile strength with film thickness is in progress, and will be considered in a subsequent report.

Discussions, Results and Analyses

Uniformity of Results of Spray-Formed and Cast Films: Because of the variables involved in the preparation of spray-formed films, a condition which has led to the obtaining of different tensile strength results with a single solution by personnel in this Laboratory and in the laboratories of the various suppliers, the uniformity of this Laboratory's test results was investigated. Tests were performed on specimens obtained from spray-formed and cast films to determine whether cast specimens would give the more reproducible results, and, if such was the case, whether a correlation could be found between the results of spray-formed and cast specimens of the same basic formulation. The average tensile strength and variance of each film were used for comparison and analysis. The groupings and experimental data are tabulated in Table II.

In order to test for uniformity of tensile strength, a statistical analysis involving an F test *(10)* on the means was used; to test uniformity of dispersion, an L_1 test *(10)* of variances was employed. The results are recorded in Table III. Specimens of C5V and D6V were omitted from the analysis since it was desired to compare the results of spray-formed films against those of cast films, and the inclusion of these specimens would result in a combination of the two methods of preparation. Specimens of C5I1 were eliminated because they represented an abnormal condition, the cause of which is discussed in a later section. (See second paragraph under "Effect of Varying Degrees of 'Wet to Dry' Spray Technique").

The F test rejected the hypothesis that the mean tensile strengths were the same, i.e., the F test led to the acceptance of a true difference in means. On the other hand, the L_1 test did not reject the hypothesis of equality of variances. Since the within-group variances were not significantly different, the average variance for each group was determined. The averages of the variances in each group were then compared by an L_1 test, and again the hypothesis of equal variances was accepted. Therefore, it is concluded that the tensile strength results of spray-formed and cast vinyl films are of equal reproducibility. The over-all average standard deviation of all the groups of materials was found to be 66.5 psi.

TABLE III—L_1 AND F TESTS

Group	L_1 Test [a]	F Test [b]
1	0.9413	66.49
2	0.9061	11.15
3	0.9615	33.35
4	0.9073	5.68
5 [c]	0.8668	11.86
6 [d]	0.9462	84.53
7	0.9541	15.70
8	0.9915	41.76
Grand Average of 1 to 8, incl.	0.8155	——

(a) Tests whether variances of a set are the same. (b) Tests whether means of a set are the same. (c) C5I1 and C5V not included (see Table II). (d) D6V not included (see Table II).

TABLE II—GROUPINGS AND EXPERIMENTAL DATA

Solution A, Group 1

Method of Preparation†	IV	IV	IV	IV	IV	IV	IV	IV	IV
Film No.	1	2	3	4	5	6	7	8	9
No. of Specimens	38	36	38	35	35	36	37	36	30
Avg Tensile Strength (psi)	1213	1135	959	1083	1149	1136	932	1036	1125
s	73	74	63	64	65	77	85	43	62
Avg Density (g/cu in.)	13.39	13.12	11.90	13.10	13.37	13.12	12.04	12.68	13.30
s	0.50	0.51	0.44	0.35	0.26	0.53	0.49	0.40	0.59
Avg Tensile Index	3.36	3.51	3.76	3.65	3.50	3.52	3.88	3.69	3.65
s	0.126	0.153	0.176	0.122	0.153	0.149	0.212	0.112	0.115

Solution A, Group 2

Method of Preparation†	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Film No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
No. of Specimens	20	19	19	17	17	19	19	18	18	20	19	20	20	19	18	18	19	19	19
Avg Tensile Strength (psi)	1984	2055	2109	1989	1988	2004	2073	2058	2019	2023	2140	2088	2063	2050	2140	2004	2179	2179	2179
s	100	112	88	81	98	76	67	41	67	75	72	57	55	88	82	75	67	67	67
Avg Density (g/cu in.)	18.71	18.67	18.65	18.45	18.50	18.56	18.86	18.89	18.76	18.80	19.09	18.96	18.86	18.75	18.74	18.96	18.80	18.80	18.80
s	0.29	0.38	0.34	0.46	0.44	0.43	0.39	0.40	0.37	0.28	0.22	0.27	0.32	0.28	0.29	0.21	0.28	0.28	0.28
Avg Tensile Index	2.76	2.68	2.60	2.72	2.74	2.72	2.70	2.72	2.74	2.73	2.60	2.75	2.70	2.69	2.58	2.79	2.80	2.80	2.80
s	0.115	0.145	0.069	0.116	0.110	0.066	0.104	0.081	0.089	0.099	0.099	0.066	0.071	0.090	0.108	0.115	0.068	0.068	0.068

Solution B, Group 3

Method of Preparation	IV	IV	IV	IV	IV	IV	IV	IV	IV	IV
Film No.	1	2	3	4	5	6	7	8	9	10
No. of Specimens	30	31	30	32	33	33	33	30	30	33
Avg Tensile Strength (psi)	1414	1489	1624	1484	1542	1429	1427	1545	1485	1462
s	60	56	73	68	79	51	68	61	57	52
Avg Density (g/cu in.)	15.70	15.75	16.30	15.63	15.42	15.00	15.57	16.02	15.66	15.50
s	0.46	0.40	0.51	0.21	0.36	0.37	0.44	0.41	0.68	0.39
Avg Tensile Index	3.34	3.20	3.03	3.08	3.04	3.19	3.28	3.11	3.14	3.18
s	0.097	0.124	0.114	0.141	0.150	0.125	0.140	0.098	0.089	0.103

Solution B, Group 4

Method of Preparation	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Film No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18
No. of Specimens	15	16	18	18	18	18	18	18	18	17	18	18	18	18	17	18	17	17	17
Avg Tensile Strength (psi)	2199	2260	2143	2211	2046	2322	2243	2241	2265	2268	2275	2178	2225	2180	2217	2160	2223	2206	2206
s	144	105	103	112	98	145	134	101	103	63	74	104	85	82	91	116	71	104	104
Avg Density (g/cu in.)	18.38	18.60	18.77	19.20	18.16	18.55	18.67	18.26	18.03	18.59	18.56	18.51	18.66	18.45	18.54	18.62	18.51	18.38	18.38
s	0.58	0.34	0.52	0.32	0.40	0.27	0.22	0.39	0.52	0.30	0.15	0.23	0.18	0.26	0.16	0.18	0.23	0.36	0.36
Avg Tensile Index	2.49	2.48	2.57	2.51	2.67	2.39	2.48	2.43	2.39	2.43	2.42	2.53	2.51	2.51	2.41	2.56	2.50	2.50	2.50
s	0.178	0.096	0.111	0.106	0.116	0.177	0.144	0.102	0.124	0.086	0.075	0.113	0.085	0.114	0.085	0.168	0.081	0.112	0.112

Solution C, Group 5

Method of Preparation	I	I	II	II	III	III	IV	IV	V	V
Film No.	1*	2	3	4	5	6	7	8	9**	10**
No. of Specimens	25	25	25	25	25	25	25	25	25	20
Avg Tensile Strength (psi)	950	1579	1184	1152	1152	1206	1108	1105	1529	1538
s	66	29	45	62	73	70	34	44	80	50
Avg Density (g/cu in.)	16.34	17.81	17.16	16.84	16.88	16.75	16.44	16.36	18.98	19.10
s	0.43	0.35	0.43	0.43	0.26	0.32	0.44	0.39	0.19	0.17
Avg Tensile Index	5.15	3.47	4.33	4.39	4.35	4.13	4.43	4.41	3.68	3.68
s	0.284	0.105	0.145	0.130	0.287	0.130	0.125	0.161	0.190	0.118

Solution D, Group 6

Method of Preparation	I	I	II	II	III	III	IV	IV	V	V	V
Film No.	1	2	3	4	5	6	7	8	9	10	11
No. of Specimens	25	25	25	25	25	25	25	25	16	16	16
Avg Tensile Strength (psi)	1618	1656	1621	1649	1434	1453	1416	1394	1626	1563	1692
s	54	69	60	66	63	40	72	73	83	84	56
Avg Density (g/cu in.)	17.45	17.77	17.07	17.03	16.08	16.35	16.33	15.96	17.37	17.43	18.47
s	0.27	0.40	0.17	0.31	0.41	0.30	0.54	0.72	0.53	0.86	0.22
Avg Tensile Index	3.23	3.21	3.14	3.04	3.34	3.33	3.42	3.39	3.17	3.34	3.26
s	0.102	0.135	0.117	0.113	0.101	0.094	0.121	0.109	0.168	0.136	0.116

Solution E, Group 7

Method of Preparation	IV Batch a		IV Batch b		IV Batch c		IV Batch d		IV Batch e	
Film No.	1	2	1	2	1	2	1	2	1	2
No. of Specimens	25	25	25	25	25	25	25	25	25	25
Avg Tensile Strength (psi)	1709	1679	1750	1744	1803	1790	1737	1722	1715	1668
s	44	52	69	45	57	50	45	56	67	53
Avg Density (g/cu in.)	18.28	18.54	18.60	18.60	18.54	18.61	18.09	18.17	1812	18.15
s	0.49	0.33	0.25	0.18	0.51	0.31	0.25	0.26	0.23	0.17

Solution F, Group 8

Method of Preparation	IV Batch a		IV Batch b		IV Batch c		IV Batch d		IV Batch e	
	1	2	1	2	1	2	1	2	1	2
	25	25	25	25	25	25	25	25	25	25
	1464	1538	1672	1638	1592	1583	1562	1636	1700	1653
	51	52	61	53	56	55	61	50	55	52
	15.59	15.78	17.40	17.34	17.03	17.09	16.77	16.82	17.01	17.64
	0.21	0.22	0.22	0.32	0.24	0.27	0.17	0.21	0.25	0.22

† Methods of Preparation: I = Very Dry Spray; II = Dry Spray; III = Wet Spray; IV = Very Wet Spray; V = Cast.

* This film was excessively dry and lacked normal cohesion.

** Films numbered 9 and 10 represent an inadvertent mixing of tensile specimens from three films.

TABLE IVA—TENSILE STRENGTH RESULTS OF SPECIMENS OF GROUP 3

Film No.									
1	2	3	4	5	6	7	8	9	10
1418	1500	1657	1486	1575	1384	1426	1600	1523	1422
1432	1473	1615	1410	1625	1414	1487	1523	1500	1444
1381	1555	1615	1513	1542	1381	1414	1675	1547	1372
1381	1500	1513	1450	1457	1476	1488	1578	1523	1488
1333	1388	1657	1513	1657	1428	1536	1592	1511	1406
1371	1430	1702	1544	1546	1486	1475	1583	1571	1414
1407	1426	1540	1439	1656	1402	1280	1589	1454	1466
1337	1470	1648	1500	1542	1500	1392	1536	1533	1406
1400	1445	1700	1527	1642	1368	1411	1571	1634	1465
1418	1430	1621	1486	1588	1445	1524	1550	1441	1536
1400	1485	1444	1450	1516	1463	1375	1511	1488	1453
1423	1535	1486	1364	1516	1448	1285	1487	1500	1452
1364	1531	1635	1486	1600	1500	1392	1500	1478	1487
1364	1385	1648	1418	1515	1564	1426	1463	1477	1545
1364	1560	1638	1447	1459	1435	1476	1500	1477	1534
1361	1459	1555	1585	1390	1348	1464	1409	1533	1395
1442	1513	1657	1470	1514	1500	1464	1511	1456	1536
1455	1540	1763	1346	1651	1425	1400	1500	1386	1428
1546	1500	1470	1666	1637	1423	1472	1487	1478	1512
1402	1555	1597	1500	1578	1426	1538	1621	1488	1466
1423	1426	1632	1551	1542	1390	1513	1575	1555	1404
1378	1459	1666	1486	1544	1414	1461	1443	1568	1488
1473	1529	1700	1581	1542	1434	1345	1551	1521	1336
1418	1405	1621	1473	1444	1412	1350	1657	1452	1575
1394	1459	1642	1527	1528	1384	1380	1607	1521	1465
1500	1515	1705	1460	1542	1375	1345	1511	1521	1465
1418	1513	1680	1567	1370	1487	1380	1536	1402	1487
1611	1567	1666	1526	1352	1402	1476	1615	1422	1487
1460	1459	1657	1388	1528	1500	1512	1535	1488	1430
1375	1588	1597	1474	1542	1328	1378	1546	1377	1430
——	1542	——	1388	1529	1400	1400	——	——	1465
——	——	——	1486	1602	1428	1380	——	——	1524
——	——	——	——	1636	1400	1475	——	——	1453
Averages									
1414	1489	1624	1484	1542	1429	1427	1545	1485	1462
				F = 33.35 *					

* Indicates significant difference between (or abnormal dispersion of) means.

TABLE IVB—TENSILE STRENGTH RESULTS OF SPECIMENS OF GROUP 3

Film No.										
1	2	3	4	5	6	7	8	9	10	Average
1418	——	1657	——	1575	——	——	——	——	——	
1432	——	1615	——	1625	——	——	——	——	——	
1381	——	1615	——	1542	——	——	——	——	——	1524
1381	——	1513	——	1457	——	——	——	——	——	
1333	——	1657	——	1657	——	——	——	——	——	
——	1430	——	1544	——	1486	——	——	——	——	
——	1426	——	1439	——	1402	——	——	——	——	
——	1470	——	1500	——	1500	——	——	——	——	1460
——	1445	——	1527	——	1368	——	——	——	——	
——	1430	——	1486	——	1445	——	——	——	——	
——	——	1444	——	1516	——	1375	——	——	——	
——	——	1486	——	1516	——	1285	——	——	——	
——	——	1635	——	1600	——	1392	——	——	——	1494
——	——	1648	——	1515	——	1426	——	——	——	
——	——	1638	——	1459	——	1476	——	——	——	
——	——	——	1585	——	1348	——	1409	——	——	
——	——	——	1470	——	1500	——	1511	——	——	
——	——	——	1346	——	1425	——	1500	——	——	1481
——	——	——	1666	——	1423	——	1487	——	——	
——	——	——	1500	——	1426	——	1621	——	——	
——	——	——	——	1542	——	1513	——	1555	——	
——	——	——	——	1544	——	1461	——	1568	——	
——	——	——	——	1542	——	1345	——	1521	——	1484
——	——	——	——	1444	——	1350	——	1452	——	
——	——	——	——	1528	——	1380	——	1521	——	
——	——	——	——	——	1375	——	1511	——	1465	
——	——	——	——	——	1487	——	1536	——	1487	
——	——	——	——	——	1402	——	1615	——	1487	1476
——	——	——	——	——	1500	——	1535	——	1430	
——	——	——	——	——	1328	——	1546	——	1430	
									F = 1.10*	

* Indicates normal dispersion of, or no significant difference between, means.

Since, as determined from the F test, the observed standard error in each group was greater than the calculated standard error, the difference in means could be caused only by improper sampling. (The observed standard error* is the standard deviation of the means. The calculated standard error† is the standard deviation of a specimen divided by the square root of the number of specimens within the film). The observed standard error, $s_{\bar{x}}$, can be attributed to two sources: the within-group error, s_w, and the between-group error, s_b. This can be expressed mathematically as follows:

$$S_{\bar{x}}^2 = \frac{S_w^2}{n} + \frac{S_b^2}{k}$$

where n = the number of specimens per group, and
k = the number of groups.

It has been determined from the data in Table II, exclusive of groups C5 and D6, that the ratio of s_w^2 to s_b^2 averages 1.12 to 1. Groups C5 and D6 were not included in the determination of the ratio of s_w^2 to s_b^2 since a deliberate effort was made to prepare films of these groups using different spray techniques, and the between-film variation would be greater than normally expected. Since the values of s_w^2 and s_b^2 are established by the data, it is necessary to vary n and k in order to reduce the magnitude of $s_{\bar{x}}$. It was determined statistically *(11)* that a reliable mean could be obtained with a sample size of 14 to 16 specimens. The integral values of n and k were therefore limited to combinations of factors of these numbers. Since $s_w^2 = s_b^2$ the above relationship may be expressed as follows:

$$S_{\bar{x}}^2 = S_b^2 \left(\frac{1.12}{n} + \frac{1}{k}\right)$$

TABLE IVC—TENSILE STRENGTH RESULTS OF SPECIMENS OF GROUP 3

Film No.									
1	2	3	4	5	6	7	8	9	10
1418	1500	——	——	——	——	——	——	——	——
1432	1473	——	——	——	——	——	——	——	——
1381	1555	——	——	——	——	——	——	——	——
1381	1500	——	——	——	——	——	——	——	——
1333	1388	——	——	——	——	——	——	——	——
1371	1430	1702	1544	——	——	——	——	——	——
1407	1426	1540	1439	——	——	——	——	——	——
1337	1470	1648	1500	——	——	——	——	——	——
——	——	1700	1527	——	——	——	——	——	——
——	——	1621	1486	——	——	——	——	——	——
——	——	1444	1450	1516	1463	——	——	——	——
——	——	1486	1364	1516	1448	——	——	——	——
——	——	1635	1486	1600	1500	——	——	——	——
——	——	——	——	1515	1564	——	——	——	——
——	——	——	——	1459	1435	——	——	——	——
——	——	——	——	1390	1348	1464	1409	——	——
——	——	——	——	1514	1500	1464	1511	——	——
——	——	——	——	1651	1425	1400	1500	——	——
——	——	——	——	——	——	1472	1487	——	——
——	——	——	——	——	——	1538	1621	——	——
——	——	——	——	——	——	1513	1575	1555	1404
——	——	——	——	——	——	1461	1443	1568	1488
——	——	——	——	——	——	1345	1551	1521	1336
——	——	——	——	——	——	——	——	1452	1575
——	——	——	——	——	——	——	——	1521	1465
——	——	——	——	——	——	——	——	1521	1465
——	——	——	——	——	——	——	——	1402	1487
——	——	——	——	——	——	——	——	1422	1487
Averages									
1425		1536		1490		1485		1479	
				F = 4.34 *					

* Indicates significant difference between (or abnormal dispersion of) means.

* Observed standard error:

$$S_{\bar{x}} = \sqrt{\frac{k\Sigma\bar{x}^2 - (\Sigma\bar{x})^2}{k(k-1)}}$$

where k = number of films, and
$\bar{x}$ = means of films.

† Calculated standard error:

$$S_{\bar{x}} = \frac{S_x}{\sqrt{n}},$$

where S_x = standard deviation of a specimen, and
n = number of specimens from which mean is obtained.

TABLE V—TENSILE STRENGTH RESULTS OF SPECIMENS OF GROUP 4

Film No.	1	2	3	4	5	6	7	8	9	Average
	2000	2282	2222	2205	2045	2292	2133	2065	2343	
	2228	2343	2105	2131	2021	2432	2416	2300	2358	
	2235	2112	2162	2259	2108	2514	2029	2118	2371	2129
	2222	2322	2102	2294	2051	2424	2264	2151	2282	
	2324	2406	2131	2194	1986	2238	1977	2191	2083	
	2243	2175	2179	2028	2197	2383	2344	2111	2293	
	1921	2384	2285	1972	1878	2432	2231	2305	2285	
	2068	2342	2000	2180	2093	2388	2314	2264	2029	2263
	2052	2277	2135	2323	2294	2432	2209	2363	2230	
	2118	2194	2184	2200	2014	2365	2151	2303	2358	
	2222	2272	2323	2228	2027	2333	2314	2235	2289	
	2243	2085	2055	2371	2166	2312	2290	2393	2324	
	2405	2314	1972	2228	1957	2333	2250	2083	2083	2178
	2447	2055	2333	2272	2031	2272	2090	2297	2256	
	2263	2294	2194	2051	1968	2235	2323	2236	2324	
	——	2305	2060	2194	1968	2235	2357	2351	2303	
	——	——	2078	2378	2000	1857	2194	2342	2212	
	——	——	2057	2303	2029	——	2500	2245	2352	
Film Average	2199	2260	2143	2211	2046	2322	2243	2241	2265	
Film No.	10	11	12	13	14	15	16	17	18	
	2299	2277	2085	2135	2283	2326	2299	2231	2212	
	2362	2445	2157	2243	2263	1948	2092	2165	2290	
	2142	2324	2054	2175	2289	2109	2205	2189	2392	2205
	2222	2324	2027	2162	2128	2189	2230	2197	2165	
	2236	2277	2250	2189	2282	2291	2179	2344	2131	
	2243	2277	2250	2243	2208	2288	2219	2069	2256	
	2424	2277	2250	2243	2038	2236	2243	2288	2179	
	2305	2108	2138	2385	2175	2208	2060	2161	2076	2212
	2212	2250	2305	2054	2333	2250	2081	2305	2184	
	2277	2197	2027	2328	2128	2283	2060	2305	2032	
	2285	2305	2314	2231	2131	2256	2197	2194	2184	
	2235	2314	2243	2250	2194	2175	2305	2274	2032	
	2250	2222	2297	2311	2148	2305	2194	2194	2181	2191
	2263	2382	2197	2115	2129	2236	2121	2305	2250	
	2243	2250	2297	2250	2085	2225	2225	2225	2333	
	2314	2250	2184	2263	2194	2131	1800	2166	2335	
	2257	2194	2109	2305	2152	2243	2194	2184	2281	
	——	2289	2025	2170	2083	——	2189	——	——	
Film Average	2268	2275	2178	2225	2180	2217	2160	2223	2206	

F = 2.26 **

** Indicates normal dispersion of, or no significant difference between, means.

F = 5.68 *

* Indicates significant difference between (or abnormal dispersion of) means.

Previously, k equaled 1, and as can well be seen from the formula, the standard error obtained is unnecessarily large. The minimum standard error is obtained when $n = k = 4$. However, the standard error obtained for $n = 5$, $k = 3$, is not much greater, and, for practical considerations, $k = 3$ is the more desirable. This is demonstrated in Tables IVa, IVb, IVc, V, and VI. Table IVa demonstrates that the means obtained by averaging all the specimens of a film are significantly different. As can be seen in Table IVb, the means of six groups of 15 specimens, obtained by random selection of 5 specimens from each of three films, give means that are not significantly different. (The specimens as listed in the tables are distributed randomly). Table IVc demonstrates that the means of five groups of 16 specimens, obtained by random selection of 8 specimens from each of two films, give means that are significantly different. The effect of the sampling technique is further demonstrated in Tables V and VI.

In order to obtain a picture of the dispersion of the tensile values, all the individual tensile results for groups 3, 4, and 7 were plotted in respective frequency distributions. The histograms are found in Figures 1, 2, and 3. The frequency distributions for groups 3 and 4 are not normal; that for group 7 is normal. However, in all cases 95 per cent of the results fall within $\pm 2s$ of the mean. Investigators *(1, 3, 9)* who have plotted frequency distributions of tensile results of rubbers, have noted skewness to the left in all cases. Unlike the rubbers, the vinyls show lack of agreement between groups 3, 4 and 7 in that right, left, and no skewness, respectively, were found.

TABLE VI—TENSILE STRENGTH RESULTS OF SPECIMENS OF GROUP 7

Film No.	Batch a 1	Batch b 1	Batch c 1	Batch d 1	Batch e 1	Average
	1642	1648	1806	1737	1750	
	1674	1594	1783	1742	1687	
	1686	1743	1796	1732	1711	1717
	1666	1684	1826	1764	1588	
	1707	1648	1848	1770	1731	
	1728	1810	1893	1635	1750	
	1707	1776	1767	1743	1744	
	1780	1737	1787	1744	1700	1766
	1796	1765	1750	1783	1743	
	1785	1888	1776	1743	1778	
	1775	1847	1757	1730	1822	
	1682	1730	1818	1756	1588	
	1674	1778	1867	1710	1640	1724
	1707	1710	1687	1818	1776	
	1695	1689	1800	1750	1736	
	1711	1648	1826	1737	1692	
	1725	1805	1794	1710	1675	
	1666	1791	1757	1818	1609	1768
	1690	1756	1875	1662	1710	
	1629	1852	1803	1692	1711	
	1733	1764	1848	1785	1657	
	1690	1791	1937	1692	1692	
	1732	1750	1820	1736	1815	1765
	1751	1789	1774	1666	1842	
	1695	1756	1696	1783	1737	
Film Average	1709	1750	1803	1737	1715	

F = 10.76 *

F = 2.10 †

* Indicates significant difference between (or abnormal dispersion of) means. † Indicates no significant difference between (or normal dispersion of) means.

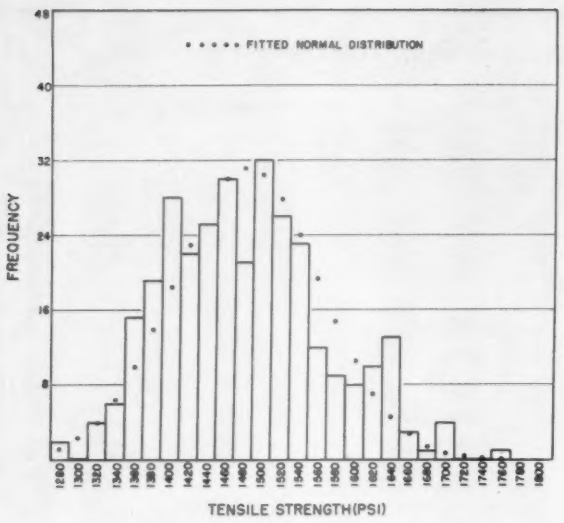

FIG. 1—Frequency distribution of Group 3.

It must be stressed at this point that all of the films mentioned were spray-formed or cast by one experienced operator. Further work is under way to determine whether the means obtained by the above-mentioned method of sampling will be equivalent if the films are spray-formed by different operators using essentially the same spray technique.

Prior to this investigation, it was postulated that cast films would give more uniform results than spray-formed films. It was therefore suggested that if a correlation could be found between spray-formed and cast films, that cast films be used for tensile strength determinations and the results for spray-formed films be interpolated therefrom. The existence of such a correlation does not seem probable. Even if such a correlation does exist, it is of no import in this investigation, inasmuch as the tensile strength results of spray-formed and cast films are of equal uniformity.

Tensile Strength Versus Density: The average tensile value and average density of the specimens of each film were plotted with density as the ordinate and tensile strength as the abscissa (Figure 4). Calculations, using the data in both linear and curvilinear regressions, show that a second-order equation fits the data better than a first-order equation. The calculated, curvilinear, correlation coefficient, R, is equal to 0.9104 (R = 1 indicates perfect correlation; R = O indicates random distribution). Films prepared from Solution C were not included in the regression calculations; Solution C appears to be basically different in composition, and probably would, if sufficient data were available, exhibit its own characteristic curve.

It should be noted here that the density as referred to in this report is the apparent density. The absolute density of a vinyl film of a particular formulation is constant, regardless of the method of forming. The apparent density of a film varies because of bubbles; the quantity and size of the bubbles are factors controlling this variation. Entrapped bubbles can be observed in the cross-sectional photomicrographs in Figure 5.

It is postulated that, for spray-formed films, the variation of tensile test results, which have been observed to exist within a laboratory and between various laboratories, is partly due to unintentional variations in spraying conditions, resulting in films of varying apparent densities, and, hence, varying tensile strengths.

Effect of Varying Degrees of "Wet to Dry" Spray Technique: The tensile values and densities of the films of solutions C and D, prepared using wet to dry spray techniques, were determined. The results are listed in Table II and plotted in Figure 6. Photomicrographs of cross-sectional specimens prepared from solution D are shown in Figure 5.

The films of solution D indicate increasing tensile strength and density values as the spray is altered from

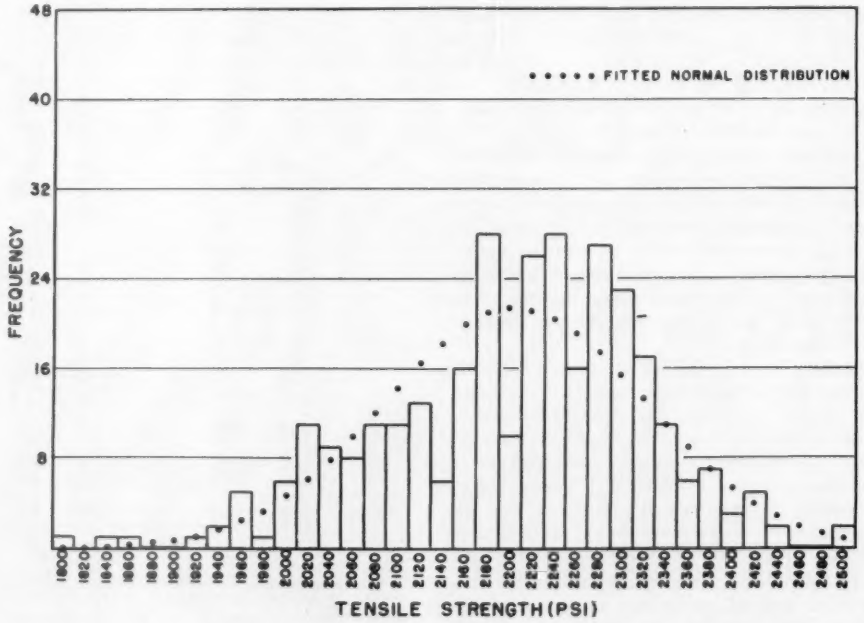

FIG. 2—Frequency distribution of Group 4.

wet to dry, with the maximum tensile strength and density being reached with cast specimens. The results of solution C are similar, with the exception of the very dry sprayed films. The results obtained from two different films of solution C, prepared using a very dry spray technique, were 950 and 1579 psi. This appeared to be quite a discrepancy; however, closer examination of the films showed that the film giving a tensile strength of 950 psi was laminated, whereas the film giving a tensile test of 1579 psi was continuous.

It may be concluded from the experimental results that the dry and very dry spray-formed films yield higher tensile values and densities, provided the film is continuous, i.e., not excessively laminated. The principal advantage of the wet-spray over the dry-spray method of preparation for test purposes is that the wet-sprayed films are smoother than the dry-sprayed films. Consequently, thickness measurements are simplified.

Correlation of Tensile Index with Tensile Strength: The tensile indices of films of groups 1, 2, 3, 4, and 6 were calculated in accordance with F-4g of Navy Specification 52C41 with the exception of using a slightly different constant (viz., 32.09) for conversion of the specimen area to 144 square inches because of a difference in the size of the tensile specimen die. The tensile indices were plotted (Figure 7) against the tensile strength as determined experimentally. Statistical regression shows that there is good linear relationship between the tensile index and tensile strength within the values tested.* The correlation coefficient is found to be 0.9816; the standard deviation of b, the slope of the line, is 43 where b is equal to −977; and the standard deviation of a, the Y intercept, is 10 where a is equal to 4662. The relationship developed is $Y = -977X + 4662$, where X is tensile index and Y is tensile strength. A tensile index of 3.4 is comparable to a tensile strength of 1350 psi (which is at present the minimum tensile strength required of materials for government purchase under Specification MIL-C-3254).

The relationship between tensile strength and tensile index appears to be reproducible for all vinyl films made from the same basic polyvinyl chloride-acetate formulation. The data obtained from solution C, which is believed to be basically different from the other materials, does not fit the curve of the data obtained from solutions

* It is realized that the arbitrary independent variable, the tensile index, is not completely independent of tensile strength; both are a function of the load required to break a specimen. For this reason, the least-squares technique may not give the "best" fit of the data but the technique is the simplest to apply, and supplies all the information needed for the discussion in this report.

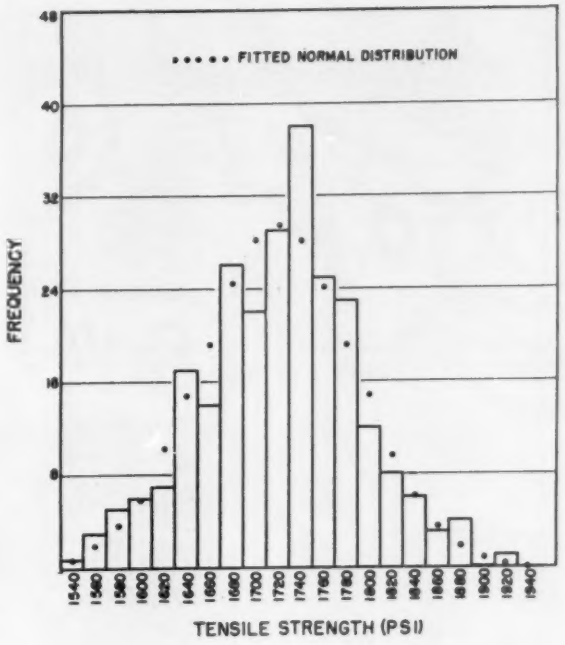

FIG. 3—Frequency distribution of Group 7.

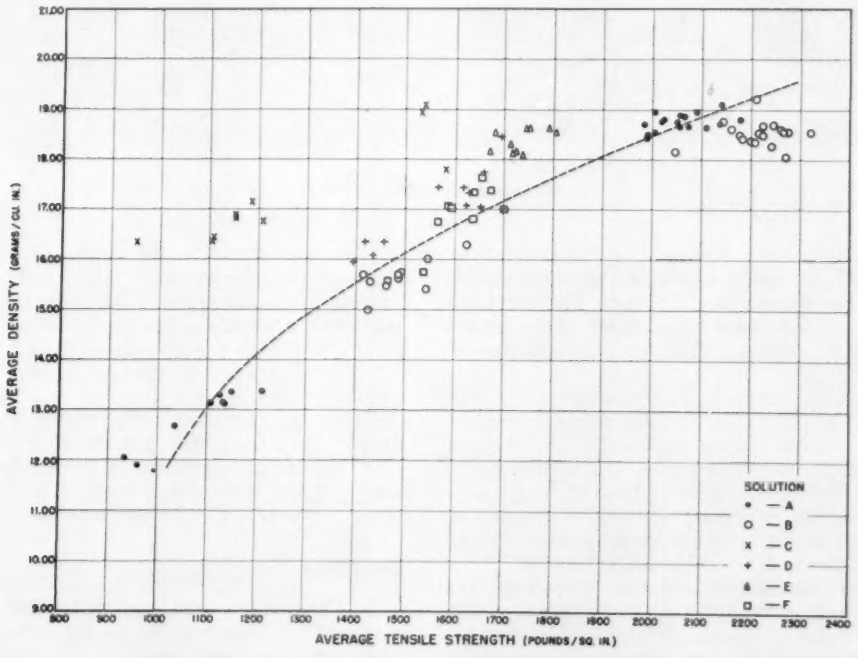

FIG. 4—Tensile strength versus density.

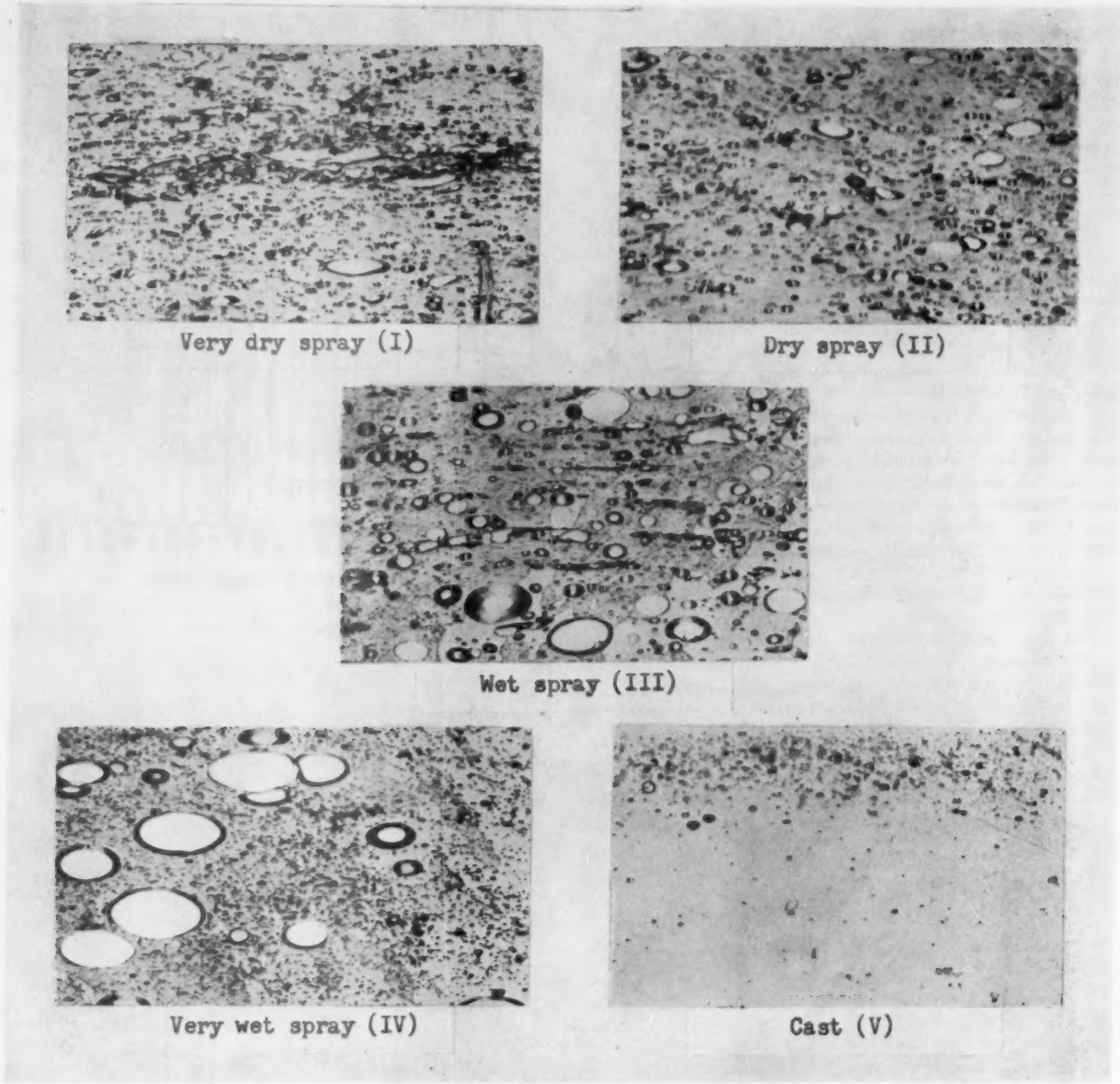

FIG. 5—Cross sectional photomicrographs of vinyl film.

A, B, and D. The former develops the linear relationship $Y = -428X + 3049$ which is significantly different from the above-mentioned equation. Further work relative to the determination of variations in the tensile strength-tensile index relationships for different formulations is contemplated.

Tensile index is less prone to experimental error than tensile strength, since the only sizeable error is that incorporated in the tensile testing machine. This error is ± 0.25 lb. in 18 to 25 lbs. The area of the specimen and its weight can be determined very accurately. The tensile strength determination is subject not only to the testing machine error, but also to a thickness-measurement error which is approximately 0.5 mils in 30 to 40 mils.

While the tensile strength-tensile index equations may change with different formulations, tensile index, nevertheless, is of correlative value. While tensile strength is one of the principal performance requirements on which the acceptance or rejection of a film is based, tensile index could be the means of preventing the acceptance of inferior materials which exhibit a barely passing tensile strength. It has been found that materials exhibiting a tensile index of 3.4 or lower, for example, generally exhibit a tensile strength of 1350 psi or higher. The converse has, as yet, not been found to be true, e.g., solution C.

Based on the above, the tensile index may be of greater value in giving a measure of the strength of a film of a specific formulation; also, the tensile strength-tensile index relationship appears to be a means of detecting changes in basic formulations.

Conclusions

1. There is no significant difference in the reproducibility of tensile strength results between spray-formed and cast vinyl specimens.
2. The observed standard error of the tensile strength

means is significantly larger than the calculated standard error. This observed standard error can be made to agree more closely with the calculated standard error by proper sampling.

3. A proper method for sampling spray-formed and cast vinyl films is to select at random 5 specimens from each of three films of the same material prepared by one operator using the same technique. The 15 specimens are used to obtain a mean.

4. Tensile strength of the spray-formed and cast vinyl films is correlated curvilinearly in a positive direction with density.

5. The tensile strength and density of spray-formed vinyl films increase as the spray technique is altered from wet to dry, provided that the film is devoid of excessive laminations, with the maximum tensile strength and density being obtained with cast films.

6. The optimum film smoothness of spray-formed vinyl films is obtained with a wet-spray technique.

7. There is a linear relationship between tensile strength and tensile index, which may vary for different formulations. For similar formulations, the relationship is reproducible.

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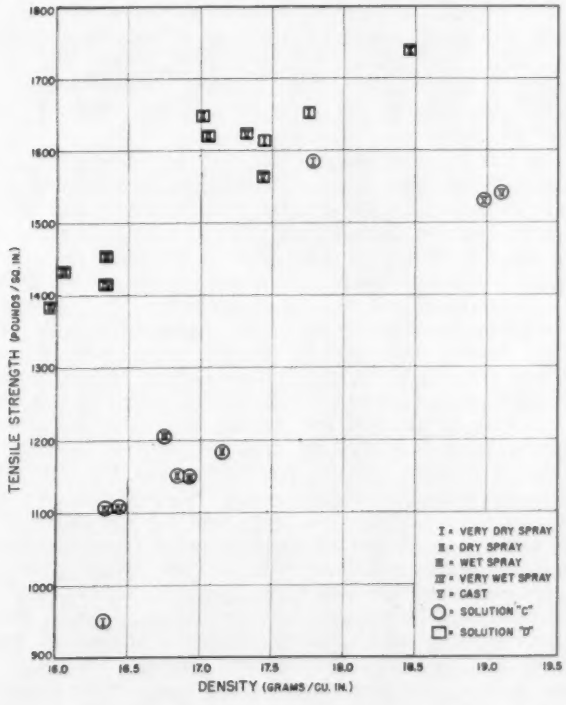
TENSILE STRENGTH (POUNDS / SQ. IN.)
DENSITY (GRAMS / CU. IN.)
I = VERY DRY SPRAY
II = DRY SPRAY
III = WET SPRAY
IV = VERY WET SPRAY
V = CAST
○ = SOLUTION "C"
□ = SOLUTION "D"

FIG. 6—Effect of spray technique on tensile strength and density.

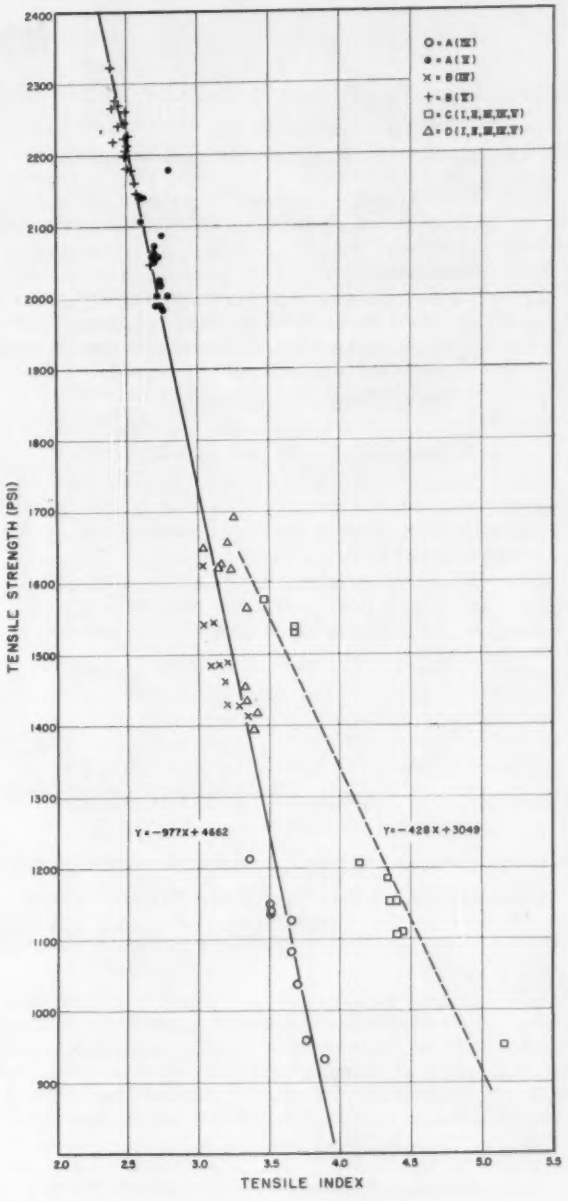

FIG. 7—Tensile strength versus tensile index.

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Appendix I

Excerpted from Specification MIL-C-3254, 25 July 1950
(Superseding AXS-1756, 23 March 1948)

Coating System, Bridging, Strippable, Sprayable

1.2 Type I.

Class 2—A sprayable, strippable, protective plastic.

3.2 Material.

3.2.1 *Type I compound.*—Formulations for type I compounds shall be stable homogeneous noncorrosive solutions, containing no benzol, chlorinated solvents, or any other highly toxic material.

3.5 Type I, Class 2 compound.

3.5.1 *Nonvolatile content.*—The nonvolatile content of the compound shall be not less than 23.5 percent.

3.5.2 *Sprayability.*—The material shall be such that it can be sprayed satisfactorily with a spray gun without the gun clogging due to lumps of undissolved or extraneous material in the solution.

3.5.3 *Speed of application.*—It shall be possible to spray a 0.035-inch thick coating on the bridged surface specified in 3.4.3 in not more than 45 man-minutes per 100 square feet.

3.5.4 *Setting time.*—The material shall be such that a coating of approximately 0.015 inch sprayed in a continuous application on a 24-inch square prebridged open frame shall become taut on the frame and ready for additional spray coating in not more than 5 minutes. At the end of this period, an additional coating of approximately 0.020 inch shall be sprayed on the initial coating and the resulting coating shall become taut on the frame in not more than 10 minutes.

3.5.5 *Tensile strength.*—The tensile strength of a 0.035-inch sprayed coating of the compound shall be not less than 1,350 p.s.i.

4.4.7 *Tensile strength and ultimate elongation of type I, class 2 compound.*—The tensile strength and ultimate elongation shall be determined in accordance with Specification ZZ-R-601, section II, 5d (1)a and 5d (1)b, using test specimen shown on figure 2a and the apparatus specified in section II, 1c for determining the minimum thickness. The coating sample to be tested shall be prepared by spraying type I, class 2 compound on a glass plate so that a coating of approximately 0.035 inch is produced. Prior to testing, all coatings shall be allowed to air dry for 24 hours and further conditioned at 77°F. and 55 percent relative humidity for 24 hours.

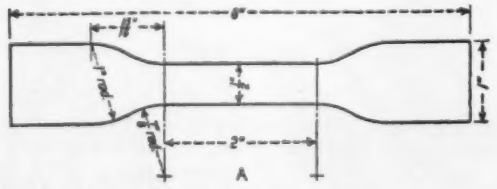
Appendix II

Excerpted from Specification ZZ-R-601a, 25 June 1940
Federal Standard Stock Catalog
Section IV
(Part 5)
Federal Specification for Rubber Goods; General Specifications
(Methods of Physical Tests - - -)

Section II

1c. *Apparatus.*—In the case of sheet material or specimens of rectangular cross-section the thickness shall be measured with a micrometer graduated to 0.001 inch under a load of 3±0.1 ounces exerted by a weight through a flat contact foot 0.25±0.01 inch in diameter.

5b (2) *Dumb-bell specimens.*



5d. *Testing equipment and procedure.*

5d (1). *Tensile strength, ultimate elongation, and tensile stress.*

5d (2) a. *Equipment.*—The machine shall fulfill the following requirements:

Tensile strength, elongation, and tensile stress tests shall be made on a power-driven machine.

The applied tension shall be indicated by a dial or scale and shall be accurate within ±0.15 pounds for loads of 15 pounds and below, and ±0.5 pound for loads above 15 pounds.

The indicator shall remain at the point of maximum load after rupture of the test specimen.

The grips which hold the specimen in the testing machine shall be of a type which tightens automatically and exerts a pressure across the gripping surface increasing as the applied tension increases so as to avoid uneven slipping, and to insure failure of the test specimen in its constricted portion.

The rate of travel of the power actuated grip shall be 20±1 inches per minute.

For circular test pieces such as rubber bands, etc., each grip shall consist of two rollers mounted on ball bearings. The action of these rollers is such that as tension is applied, they rotate in opposite directions, thus tending to equalize the stress around the periphery of the test piece.

5d (1) b. *Procedure.*—The test specimen shall be placed in the grips using care to adjust them symmetrically in order that the tension shall be distributed uniformly over the cross-section. If the tension is greater on one side of the test piece than on the other, the gage marks will not remain parallel and the maximum strength of the rubber will not be developed. The ultimate elongation shall be measured by means of a scale or other device which shall be used in such a way as not to touch the specimen and shall be capable of indicating the elongation with an accuracy of 0.1 inch. Two operators may be required for making the test. The value of the elongation shall be recorded together with the original distance between the gage marks from which data the ultimate elongation may be calculated. (See section II-5a.) After the rupture of the specimen, the breaking load in pounds shall be noted from the dial or scale and recorded, together with the original minimum width and thickness of the specimen, so that tensile strength may be calculated. (See section II-5a). The cross-section shall be considered as the product of the width and the thickness of the test specimen (pars. II-1 and II-2). The procedure for determining the tensile stress shall be the same as for tensile strength, except that the load necessary to stretch the specimen to the specified elongation shall be recorded.

Appendix III

Excerpted from Specification 52C41, 15 June 1946
(Superseding O.S. 3602, Revision A, 3 December 1945)
Coating, Adhering, Strippable, Spray Type

E-10. *Tensile index and ultimate elongation.*

E-10a. *For qualification (type or brand approval).*—The tensile index and ultimate elongation of the coating at a thickness of 0.040±0.005 inch shall be as follows (see par. F-4g(1)):

Tensile Index:	3.5 maximum
Ultimate Elongation:	200 percent minimum

F-4g. *Tensile index and ultimate elongation.*

F-4g(1). *For qualification (type or brand approval).*

—The tensile index of the spray coating shall be defined as the coating weight in grams per square foot divided by the pounds of tension load required to break a tensile specimen ½ inch in width. The tensile index and ultimate elongation shall be determined using test specimens of the dimensions shown on Figure 2A of Federal Specification ZZ-R-601. The tests shall be conducted at a temperature of 77° ±2°F. and test specimens shall be conditioned at this temperature for 16 to 24 hours before testing. The equipment and procedure shall be in accordance with Federal Specification ZZ-R-601, except that the original weight of the specimen in grams shall be recorded rather than the minimum thickness of the specimen. The coating sample to be tested shall be prepared by spraying on a glass or metal plate so that a coating 0.040±0.005 inch is produced. After 16 to 24 hours drying at room temperature (77° ±5°F.) the coating shall be dried, while still on the supporting plate, for 72 hours at 130° ±2°F. Steps should first be taken to seal the coating at the plate edges by any suitable method so that shrinkage of the coating does not occur during the drying period. Three specimens shall be taken from the coating sample, weighed on an analytical balance to the nearest centigram and tested. The weight of specimen in grams divided by the load at break in pounds and multiplied by 32.6 gives the tensile index value. When a specimen breaks in the clamp or if the result of a single specimen is more than 10 percent higher than the average of the 3, indicating a poor specimen, the high result is discarded and an additional specimen tested. Tensile index and ultimate elongation shall be the average of the 3 accepted values. If the result thus obtained fails by less than 5 percent to meet the requirements of this specification, a check test is made with 3 additional specimens, results of which computed as above shall be considered final.

ACKNOWLEDGMENT

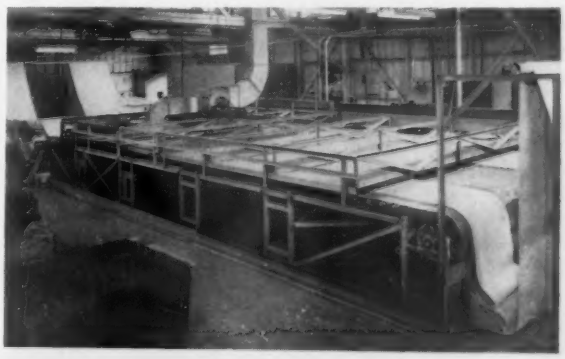
The authors wish to thank Mr. Frederick T. Mencing for preparation of the specimens, Messrs. Walter A. Shebest and Andrew Zemzik for performing the tensile strength tests, and Dr. C. West Churchman for reviewing the original manuscript and offering helpful suggestions on the statistical phases.

Infra Red Heaters Replace Bulbs for Latex Vulcanization

CHENILLE carpeting made by Peirce & Company in Los Angeles, California, utilizes latex backings applied by roller coaters to make the carpets non-skid and to keep the loop pile in position. The latex backing must be vulcanized within three minutes. To accomplish such vulcanization the company utilized infra red bulbs, but found some difficulty with the method. For example, the bulbs gave a pattern of "hot spots" and had to be placed some distance away from the carpeting. Further, because the carpeting gave off considerable steam, bulbs would arc in the sockets, creating a fire hazard. Also, burn-outs made maintenance costly.

All of these problems are reported to have been eliminated with the installation of a Corona infra red oven equipped with infra red Pyrex tube heaters, a product of the Corona Manufacturing Corp. of Glendale, Calif. In this installation, twenty-eight standard Corona infra red panels radiate an area of 13 feet by 22 feet. Arrangement of various wattages throughout the oven is said to give maximum heating efficiency and reduced power requirements approximately 25% over the former infra red unit. Total oven capacity is 195 k.w. Carpeting travels through the oven at a rate of approximately 12 feet per minute and vulcanization is accomplished in less than two minutes. The conveyor has also been improved by eliminating the slat-type traveling surface and substituting a series of rollers which propel the carpeting through the oven.

According to the Corona Manufacturing Corp., selection of the Corona-Merco Heater (as it is called) was made because the surface of the tube itself remains relatively cool since Pyrex has excellent transmission properties. This characteristic reduces fire hazards and permits location of the heater closer to the work without danger of "hot spots." Closer placement is important because infra red intensity varies as the square of the distance. If the distance is halved, the intensity is multiplied four times.



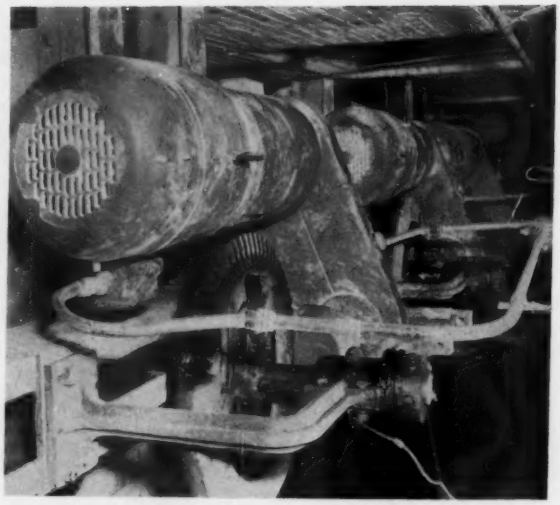
Over-all view of the Corona-Merco heating unit in the plant of Peirce & Company in Los Angeles. Twenty-eight infra red panels are used in this installation.

Fluid Drives Replace Line Shaft Operation at Elfskin Plant

VARIOUS types of artificial leather for shoe linings, book covers, seat covers and other applications are produced by the Elfskin Corporation at its plant in Cherry Valley, Worcester, Mass. This simulated leather is essentially cloth impregnated with specially processed rubber. The rubber is fed in sheet form to churns and mixed with naphtha to form various impregnating compounds.

Elfskin utilizes three churns, each of which is equipped with a cone-shaped agitator which is constructed with cutouts to relieve the load and reduce the amount of power required. For many years these churns were operated by a 25 hp motor from a line shaft. Production then required the use of only 1½ churns for eight hours, but in recent years all three churns have been operating on a 24 hour-a-day basis.

Line shaft operation was discontinued about three years ago and replaced by individual Electrofluid Gearmotors, products of the Link-Belt Co. of Chicago, equipped with 10 h.p. motor and connected to agitator bevel gearing through a precision steel roller chain drive enclosed in an oil-retaining casing. The drives must overcome a heavy inertia load and also be able to handle a load of varying magnitude, inasmuch as the contents of churns will vary from sheets of rubber immersed in naphtha to a pasty mass at conclusion of the agitating cycle.



Close-up view of the 10 hp motors on top of the rubber churns showing the encased precision steel roller chain drives.

View of the three churns at the Elfskin plant, each of which is now equipped with an individual Electrofluid Gearmotor.

Instead of throwing a mechanical friction clutch into engagement, the operator now pushes a button to start an individual churn, and then lets the fluid drive adjust itself automatically to the starting load and the varying loads imposed upon it. For example, the starting load might be 20 amperes, and the running load only 8 amperes. The fluid drives installed provide smooth starting and smooth running at all times, regardless of the load, and with minimum power consumption.

The Electrofluid Gearmotors now used at the Elfskin plant are said to be a compact, integral combination of motor, fluid coupling and enclosed gear reduction, with output speed of 268 rpm. The 10 hp motors are totally enclosed, fan cooled, wound for 3-phase, 60 cycle, 550 volt alternating current.

A high-power, high-resolution, optical instrument for the measurement of small variations in surface smoothness or thickness variations in thin films has been developed by the Farrand Optical Co., Bronx Boulevard and East 238th St., New York 70, N. Y. Called the **Farrand Interference Microscope,** the unit may also be applied to thermal expansion measurements.

Titeflex, Inc., of Springfield, Mass., has announced that its **Quick-seal leak-proof coupling** is now available in heavy-duty models for high-presure, heavy-flow applications. Use of this coupling is said to make the hose line leak-proof the moment the nipple is seated in the coupling body and to seal it tighter the higher the pressure builds up.

Richardson Scale Co., Clifton, N. J., has introduced a new **industrial batching scale** designed for weighing hot materials in high-tonnage quantities. Key features include an extra-large weigh hopper (25 cubic feet), a dust-tight housing covering the entire scale, separately housed controls, and ⅜-inch steel plate contacting the material being weighed. It is especially useful for plastics and chemicals.

Increased operating efficiency in aisles as narrow as six feet is said to be possible with the use of a **new materials handling truck** developed by the Yale & Towne Manufacturing Co., Philadelphia, Penna. Called the RSAT-3 Warehouser, the truck is equipped with extendable forks which reach beyond the outrigger wheels to pick up and deposit loads.

Observations and Reflections on the European Rubber Manufacturing Industry

(Concluded from Preceding Issues)

By M. E. LERNER
Editor, RUBBER AGE

AFTER a delightful week-end on the French Riviera, which included a visit to Monte Carlo (where I made a modest contribution), we flew to Rome. Although Paris is, as previously described, a symbol of beauty, the Eternal City is far more interesting. Here one lives and breathes history and the turning of every corner is an adventure by itself. Any visit to Europe which does not include an extended stay in Rome is a lost venture.

Our host in Italy was the Pirelli Company and words are almost inadequate to describe the many courtesies and kindnesses shown to us by various members of this world-famous organization. Among these were Dr. Ubaldo Zoboli, who heads up the Rome office; Dr. Paolo Trotto, an executive of the home office in Milano; Dr. Angelo Martinenghi, a vice-director and general purchasing agent (and who has represented Italy as a delegate at every meeting of the International Rubber Study Group but one), and Mr. Arrigo Castellani, advertising manager. Others included Dr. Stefano Oberto, Mr. G. Zanni, Dr. Marco Corvo, Dr. Guido Cesura, and a number of chemists and engineers.

The Pirelli organization was founded in 1872 and established the first factory for the production of rubber goods in Italy. It is currently engaged in the manufacture of almost every known type of rubber product, either in its own factories or through affiliated companies, but its own table of organization is divided into three main divisions, namely, insulated wire and cable, tires and tubes, and technical goods (mechanicals, drug sundries, latex foam, proofed goods, etc.). The main factory is located at Bicocca (see photograph). There is another at Tivoli (near Rome) and a third at Settimo Torinese (near Turin). A new factory for the manufacture of electric cables is being constructed at Arcofelice (near Naples). Aiding and abetting the production of these factories are literally dozens of small plants, most of them located in Northern Italy, where specialties of various kinds are produced. In addition, the Pirelli organization maintains plants for the production of rubber chemicals, cotton yarn, high tenacity rayon yarn, etc.

Airplane view of the giant Pirelli works at Bicocca (near Milano). This is the main Pirelli factory in Italy and it occupies some 8,000,000 square feet.

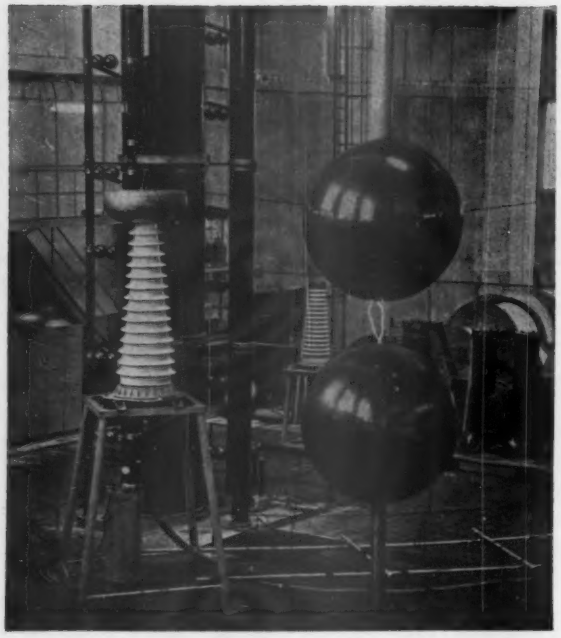
The Pirelli Company is capitalized at approximately $40,000,000 and stockholders number some 33,000. The parent company alone employs over 22,000, approximately 14,000 being employed at the main factory in Bicocca. In all, however, the Pirelli organization, including its affiliated companies and its international group, gives employment to over 50,000 people. In the international group are companies with factories in England, Belgium, Spain, Brazil, Argentina, and Canada. A rubber plantation is operated in Indonesia.

Research activities are centered at the Bicocca plant and the importance of research to the company's operations can best be realized from the fact that the laboratories at Bicocca occupy a floor space of approximately 250,000 square feet and utilize the services of more than 900 technologists, engineers, chemists, and other personnel.

Over-all view of the Pirelli plant at Tivoli (near Rome). This unit is devoted to the manufacture of tires and tubes and is located in a historical area.

Visits to Pirelli Factories

The first Pirelli plant we visited was the one located at Tivoli which is approximately 40 miles northeast of Rome. Tivoli is located in one of the most historic areas of Italy, since its sulfur springs were a major



Some of the high tension cable testing equipment utilized by the Pirelli organization is seen in this view of the Electrical Laboratory at Bicocca.

attraction to the rulers of ancient Italy, and the area features ruins of many notable residences including Villa Adriana and the famous Villa d'Este which has some 1,000 operating fountains. Here we had an opportunity to talk with Guido Giudici, works manager; Andrea Fabbri, assistant works manager, and Giuseppe Rovelli, production manager.

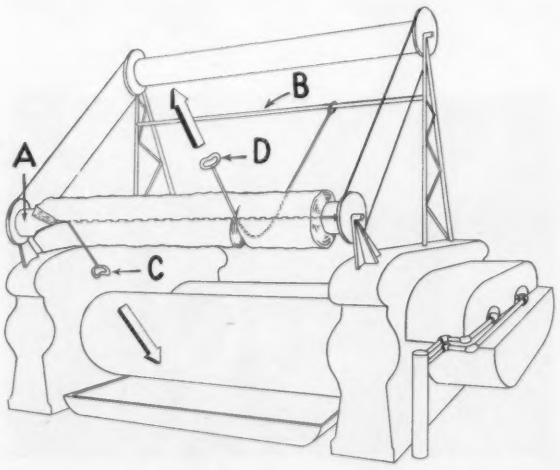
Production at the Tivoli plant is devoted exclusively to tires and tubes. During World War II, the plant was practically destroyed by bombing and some 75% of the present plant represents reconstruction. Rehabilitation of the plant permitted the installation of the latest type of tire building equipment and the plant is a model of present-day tire production. All types of tires and tubes are produced and the usual European problem is encountered, since over 100 different types and sizes of tires are in production. Tire engineers in particular will appreciate this problem, not only from the standpoint of production processes, but from the storage of molds.

The Tivoli plant utilizes Banburys, plasticators, refiners, mixers, calenders, and the other type of heavy equipment found in major tire plants all over the world. It utilizes a simple but ingenious method of stripping rubber from the mixer rolls which is indicated by the accompanying sketch. In this method, rubber is fed from the plasticator to an open mixer. Wind-up rolls are placed above the mixing unit (see sketch). Two strips of steel wire with aluminum handles are placed along the surface of the first wind-up roll (A) with one wire anchored to the end of the roll and the other to a steel bar above the roll (B). The rubber from the mixer roll is fed to and wound up on the first wind-up roll (A). After it has been built up on the wind-up roll, the roll is stopped and the operator pulls the first steel wire (C) longitudinally across the roll, thus cutting the rubber and allowing it to be fed back to the mixer roll, or, if properly refined, to the second or upper wind-up roll. The second wire (D) cuts the rubber diametrically while the roll is moving. The handles are made of aluminum to prevent possible damage to the mixer rolls in case they drop between them.

Incidentally, bachelors find the Pirelli plant at Tivoli an ideal working spot. The company maintains a special villa (mansion) for its bachelors a short distance away from the plant. Each occupant of the villa has his own room and shares recreational facilities with the other occupants. Particularly appetizing meals are served at the villa (as the author can personally testify) and the view from almost any part of the house is truly magnificent. Occupants are charged a mere pittance and many a bachelor thinks twice before entering matrimony.

Moving north to Milano after having spent a few delightful days at Florence and Venice, we next visited the Pirelli plant at Bicocca, which is on the outskirts of Milano itself. Our host on this occasion was Dr. Trotto and we were taken on a quick tour of the extensive works. The Bicocca plant is not a single unit, but consists of a number of factory buildings covering over 8,000,000 square feet. Not only are insulated wire and cables, tires and tubes and technical goods manufactured in the plants occupying this acreage, but it is also a metallurgical center, since Pirelli produces its own rods and cores for cable and operates its own wire drawing equipment. Electrical cables of every conceivable type are produced at Bicocca, including the submarine cables for which Pirelli has long been famous. The electrical laboratory is among the finest of its kind in the world and is fitted with high tension testing equipment of the latest type, much of which was developed by company technicians.

It is not possible in the limited space available to adequately describe the numerous manufacturing processes utilized at Bicocca and, therefore, it will have to suffice to state that the equipment is equivalent to that found in the most modern types of rubber factories and the processes utilized are completely up to date. The Pirelli organization has earned a well-merited reputation for development of rubber machinery and equipment which is produced under license by machinery companies in many parts of the world, including the United States. It is especially known for its work on tire building machines and its engineers are constantly striving to produce a machine that will completely build a passenger



Sketch of the system used at the Pirelli plant in Tivoli to strip rubber easily from mixer rolls (see text for complete description).

car tire in less than a minute. It is much closer to this goal than is generally realized.

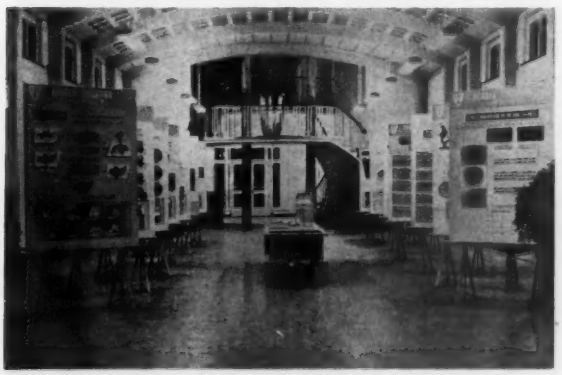
Excursion Into Germany

After resting for a few days in the Swiss Alps, we continued our trip with a visit to Germany where we talked with several manufacturers of rubber machinery and equipment in Stuttgart, Cologne (Köln), Dusseldorf and Krefeld. We were given an opportunity to see some of the latest developments in such machinery and equipment and learned a little more about the background of some of these companies which have extensive plans for marketing their equipment in the United States and Canada. It is not necessary at this point to dwell upon some of these developments since they will be referred to in one form or another in future issues of RUBBER AGE. While at Stuttgart, we also had the pleasure of a long talk with Dr. Hans Diegman, editor of *Gummi und Asbest*.

The highlight of our tour in Germany was a visit to Farbenfabriken Bayer at Leverkusen, which is a few miles from Cologne. Here we had a series of interesting conversations with Dr. Otto Konrad, chief of the rubber and plastics department (who developed Perbunan); Dr. P. Stocklin, head of the rubber section, and Dr. K. Hansen, head of the plastics section. I was also fortunate enough to meet Dr. W. Scheele, who is head of the Technical Rubber Institute at Hanover and who was visiting Leverkusen the same day.

It should be explained that Farbenfabriken Bayer, A.-G., was formerly part of I. G. Farbenindustrie, A.-G., which was taken over by the Allied Powers in 1945 and put into liquidation. Farbenfabriken Bayer emerged as one of the resulting successor companies and the property transferred to it included the works at Leverkusen. Products currently manufactured by the company at Leverkusen include Perbunan (nitrile rubber), Vulcollan (polyester rubber) and numerous rubber chemicals and compounding ingredients (Vulkacit, Desmodur, etc.).

The town of Leverkusen, which centers about the Farbenfabriken Bayer works, secured its name from the Leverkus family, although its prosperity stems from the chemical company. The Leverkusen factory was started by Carl Duisberg in the early 1900's and is divided into six main streets, three running north to south and three east to west. This simple layout has been maintained through the years and provides for easy movement of goods throughout the vast factory area. At present, approximately 16,000 are employed at Leverkusen, but only a small percentage of this total are involved in the production of synthetic rubber and rubber chemicals.



The story of rubber is told in panel form in the demonstration hall of the Rubber-Stichting building. Actual specimens of products are also exhibited.

Central part of the Rubber-Stichting building in Delft, Holland. The letters of the words above the doors are made of rubber.

One cannot help but be impressed when entering the administration building of the Farbenfabriken Bayer factory. The offices are located off massive halls, which one enters through marble-columned corridors. All of the elevators in the administration building, as well as in some of the factories, are of the continuous operating type, with the ascending elevators crossing over at the top floor to become descending elevators. The speed of the elevators is so regulated that there is no difficulty whatsoever in getting on or off them. (It is interesting to note that the building codes of most of our own states prohibit continuous operating elevators).

The rubber and plastics laboratories at Leverkusen are scattered over four floors. Here considerable work is being carried on in connection with Perbunan, Vulcollan and Multiprene (the new isocyanate foam developed by the company). Considerable work is also being done to improve the storage stability of Vulcollan, which is proving very popular for shoe soles in Germany. Although some experimental tires have been made with this polyester rubber, the F-B technologists are of the opinion that it will be several years before a satisfactory Vulcollan polymer for commercial tire use will be developed.

As for Multiprene, Farbenfabriken Bayer has licensed many companies throughout Europe on the use of this material. Since the reaction of the polyester and isocyanate is so rapid, Farbenfabriken Bayer has devised special molding equipment which it sells for as little as $10,000 a unit to its customers. Although the raw materials involved are costly, the F-B chemists maintain that the cost of end products is comparable to that of latex foam sponge products because only one-half of the amount is involved for the equivalent density properties. No visit by a rubber technologist to Germany is complete without a stop at Leverkusen.

View of the recently-opened General Tire plant on the outskirts of Amsterdam. It is geared to produce approximately 400 tires per day.

Tour of Holland

Next on the agenda was a visit to Holland where we saw various laboratories and factories interspersed with visits to the rubber trading posts in Amsterdam. No visit to Amsterdam is complete without a water tour through the grachts (canals) which cut Amsterdam into dozens of small communities. One would have to live in Amsterdam many years to learn how to circumvent these canals in order to get from one part of the city to another.

The first visit we made in Holland was to the Rubber-Stichting at Delft, which is about 40 miles southwest of Amsterdam and which we approached through The Hague. Our host at Rubber-Stichting was Dr. R. Houwink, the managing director, and, fortunately, we had an opportunity to spend some time with Dr. A. Van Rossem, former head of the Netherlands Rubber Institute which is also located in Delft.

The Rubber-Stichting (Rubber Foundation) is a non-commercial organization financed by the rubber producers of Indonesia, and like similar organizations in England and France it is devoted to stimulating the demand for natural rubber. It employs approximately 250 people, is housed in a two-story building of its own (constructed in 1950), and is truly a "house of rubber." For example, in addition to a permanent section there are temporary exhibits devoted to specific rubber products and specific help on the manufacture of any of these products is offered to all visitors by the technical staff of the organization. The permanent exhibit is, of course, primarily devoted to relevant botanical matters and the history and development of cultivated rubber. Paintings on the wall in the demonstration hall also carry out this theme.

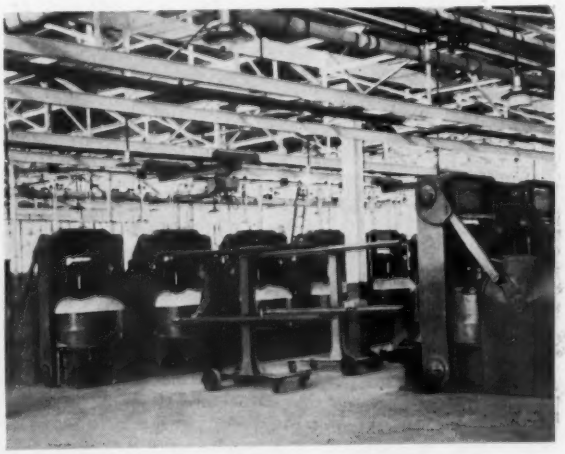
No space is wasted at Rubber-Stichting and the entire two-story building is virtually a testing laboratory. For example, different types of rubber flooring, including those troweled from latex emulsions, are to be found throughout the building and careful records are maintained as to the wear and performance of all these different flooring types. There are some 200 seats in the lecture room and numerous types of rubber cushioning are utilized for these seats with careful comparative evaluations constantly being made. The blackboard covers used in this room, incidentally, are made of cast latex from an old Indonesian pattern. One week rubber courses given by the Foundation to students and others are held in this lecture room.

Like many other organizations throughout Europe, employees at Rubber-Stichting have a coffee break in the morning and a tea break in the afternoon. It was interesting to note that even the teapot covers were made of rubber. Rubber mats of all types are utilized at the entrance of the building and it is suspected that the stationery used by the personnel is probably latex impregnated. The work done by the Rubber-Stichting in this regard is unequalled by any other organization, institution or association concerned with rubber.

Like its sister organizations in England and France, Rubber-Stichting also accomplishes a good deal of research work and is equipped with complete laboratories and testing facilities. The result of its researches are presented before technical organizations when and wherever the opportunity presents itself and members of the research staff must be linguists since they are called upon to give their talks in English, French, German, Dutch, and the various languages of the Far East. At the moment, the research staff is concerned with the continued use of natural rubber in tires and its equipment at Delft includes tire molds. Dr. H. C. J. de Decker is director of research for the Foundation.

As part of its propaganda service, Rubber-Stichting publishes two rubber journals, one in Dutch *(Rubber)* and the other in German *(Kautschuk Anwendungen)*. It also supplies displays of rubber and rubber products on request and has worked out a system under which it can deliver a complete display to any point in Europe upon three days notice. At the moment, the Rubber-Stichting staff is working on a ten language rubber dictionary which will probably be published within the next several months.

While in Delft, we also took the opportunity to visit with Dr. Geldof, director (who succeeded Dr. A. Van Rossem), and Dr. Van Gils, rubber research chemist, at the Rubberinstituut, T.N.O. This institute is one of several industrial research groups maintained by the Netherlands government in conjunction with private industry (somewhat along the lines of the Research Association of British Rubber Manufacturers in England). It is located in the University of Delft, but according to present plans will be housed in a special building along with other T.N.O. units within two or three years. Some of its present equipment is a bit on the antiquated side, but this condition is expected to be remedied when the institute is moved into the contemplated building. The Rubberinstituut, T.N.O., now employs fifteen people and is devoting a good deal of its present facilities to the improvement of ozone testing equipment.



Part of a battery of tire presses utilized in the Goodyear plant at Colmar-Berg. This plant turns out more than 1000 tires per day.

General Tire Plant at Amsterdam

It was also our privilege to visit the new General Tire plant which is located on the edge of Amsterdam and which is being operated by the General Tire and Rubber Co.-Holland, N.V. At the time of our visit, this factory had not yet been officially opened and, as a matter of fact, initial production had not yet been started. The plant has since been officially dedicated and is currently in production.

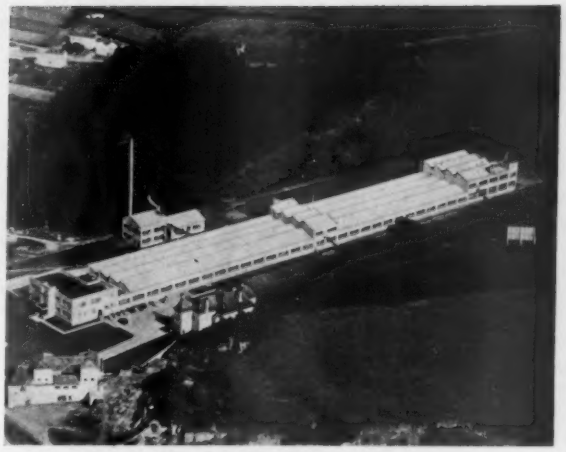
The new General Tire plant at Amsterdam was built by the municipality and is leased to the operating company with an option to buy. It is a one-story building, 560 feet long by 170 feet wide (roughly 100,000 square feet), and occupies a total area of seven and one-half acres. It is currently employing about 100 and expects to double this amount in the near future. The plant is geared for a production of 400 tires per day, about half of which are for passenger cars, the balance being divided among truck, tractor, earthmover, and other heavy-duty tires. Like most factories in Holland, the plant is built on piles and although no Banbury has as yet been installed, piles have already been driven for such installation.

Laid out in the most modern style, the new plant can truly be called a Shaw-equipped tire production unit since almost every major piece of equipment has been supplied by Francis Shaw & Co., Ltd., of Manchester, England. Included among this equipment are six 84-inch mills and one 8-inch tuber with present plans calling for a 10-inch tuber in the near future. The eventual goal is to produce approximately 80,000 inner tubes per year. The plant was built at a cost of $2,500,000.

Operation of the Amsterdam plant is in the hands of a capable group of executives headed by W. Brusse as director. Mr. Brusse is a native Hollander with an extensive background in both electrical engineering and financial affairs. Other executives include Joseph Delaplane as plant manager, Jack Young as production manager, John Kaas as technical superintendent, and Walter W. Wagner as sales manager. Mr. Delaplane has been with the General Tire organization for about ten years having seen service at both the Wabash and Waco plants. Mr. Young has been with the company some twenty-one years and before coming to Amsterdam spent six years at the General Tire plant in Chile. Mr. Kaas joined General at Akron about two years ago after having spent six years at the plant of the Goodyear Tire and Rubber Company in Java. Mr. Wagner, a graduate of Columbia University, has seen considerable sales service with the Firestone International Company in the Near and Middle East and in Europe.

Visit With the Brothers Veth

Before leaving Holland, it was also my good fortune to spend some time with the executives of Veth's Papierenzakken Fabriek N.V. which has its headquarters in Amsterdam. Among other things, this concern is a licensee of the St. Regis Paper Company and sells various types of baling materials to natural rubber producers throughout the world including both coated paper and polyethylene specialties. The company is operated by the Brothers Veth whose grandfather lived in the house in which the company is located and who made sails for vessels plying the Eastern trade. The house is alongside the harbor and offers an excellent view of the busy harbor activity. Incidentally, the company has available some interesting 8 mm. movies of special packing procedures utilized in Malaya, Indonesia, and other rubber packing areas.



The Goodyear plant at Colmar-Berg in the Duchy of Luxembourg is nestled in a valley and makes a picturesque view, as seen in this photograph.

Goodyear Plant at Luxembourg

One of the final visits we made before finishing our tour was to the plant of the Goodyear Tire and Rubber Company in the Grand Duchy of Luxembourg. Operated by Goodyear S.A., this plant is actually located at Colmar-Berg which is some 30 miles from Luxembourg City and is nestled in a valley. Approaching the plant from Luxembourg City by car, one gets a beautiful view of the plant from the top of a hill, the view being doubly enhanced due to the multi-colored flowers which surround the administration building. The view of the plant from the hilltop by itself is worth the trip.

Designed by Goodyear engineers, the Luxembourg plant is very reminiscent of the tire units in and about Akron, and utilizes the latest type of equipment. It employs some 550 people, is equipped with a No. 11 Banbury, and produces between 1,000 and 1,200 tires per day. It utilizes straight line production and has a comprehensive laboratory not only for control purposes but for research work as well. Some wire cord tires are made at this plant, and tubeless tires are in experimental production.

The Luxembourg plant works very closely with the home office at Akron on both technical and production matters, and management rests in the capable hands of Art Ruston who has had almost 25 years of service with the Goodyear organization, including service at plants in Peru, Mexico and England. C. P. Wurth is chief chemist of the plant having previously served as chief compounder. A Luxembourger by birth, Mr. Wurth is a graduate of the Massachusetts Institute of Technology. H. L. Matheson is superintendent.

Some General Observations

After visiting dozens of rubber factories and laboratories in eight European countries, it is natural that I secured some general impressions of the over-all European rubber manufacturing industry. For what they may be worth, they are recorded below:

The rubber manufacturing industry in Europe seems to be bursting its seams. With few exceptions, the factories appear to be hemmed in and pleading for expansion. In many of them there are so many production lines that little aisle space is available.

The industry seems to be on a par with that of the United States from a technical point of view, but is still considerably behind mechanically. This observation by no means applies to all of the plants visited, but it does apply to a good number of them.

The synthetic rubbers are in evidence at almost every plant, but are not utilized in the same percentages found in American plants. This usage, however, is constantly increasing and it should not take too many years before a 50:50 ratio with natural rubber is reached.

Usage of grades of carbon black varies from country to country because of governmental limitations and specific needs. For instance, there is hardly any call for high speed tires in England which means little need for SAF or ISAF blacks, but the reverse is true in countries such as France and Italy.

Europe is much further advanced in the use of polyester rubbers and isocyanate foams than is this country, primarily because of the excellent work being done on these materials by Farbenfabriken Bayer at Leverkusen. The extremely liberal terms offered to licensees may be one of the reasons for the steadily increasing use of these materials.

With the exception of plants in Germany, a good deal of American-made machinery and equipment is in evidence throughout Europe. It is a rare tire plant that does not have at least one battery of Bag-O-Matic presses in operation. Rotocure presses are found in many of the belt plants.

Every tire plant in Europe is faced with the problem of producing a wide variety of tire sizes, with some plants producing as many as 100 different sizes. The tire engineers in these plants are very envious of American tire producers and their standardized sizes.

European rubber manufacturers are watching the rubberlike plastics as closely as do our own manufacturers. Polyvinyl chloride and the other rubberlike resins are in evidence in many plants.

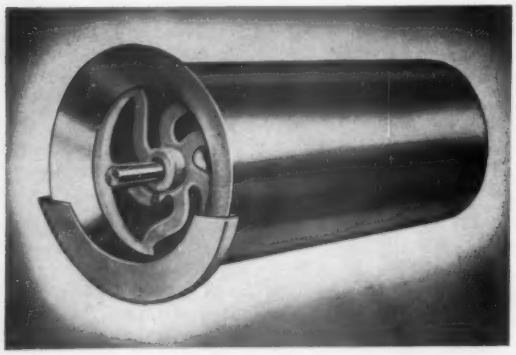
Manufacturers of reclaimed rubber in Europe somehow seem to be able to avoid the peaks and valleys which plague our own producers. Many of the commercial reclaimers seem to enjoy a steady even flow of production, a portion of which is marked for export in almost all cases.

Because of the economy existent in Europe plus the proximity of one country to another, exporting is a vital function to every company and competition in this field is exceptionally keen.

In concluding this series, I sincerely believe that there is a good deal to be learned by visits to rubber factories and laboratories throughout England and the Continent and I urge that management adopt a more liberal attitude in the future with regard to sending their technologists abroad to inform and be informed.

Carroll Cooling Cylinders

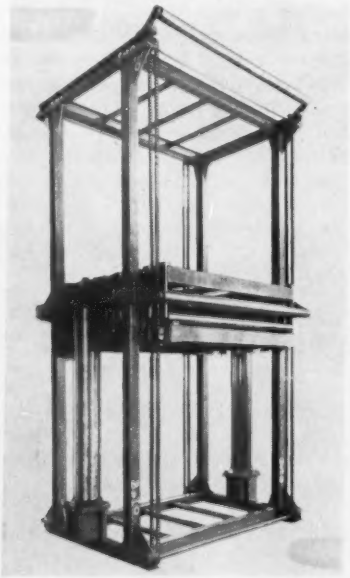
Open end cooling cylinders which find application in the cooling of many types of coated materials, including rubberized fabrics of all kinds, are produced by J. E. Carroll & Co., Lowell, Mass. The theory behind these effective cylinders is relatively simple. Water at available line temperature is fed through an open end of the cylinder to an average depth of 3 inches. The water "climbs" the walls as the cylinder revolves and, because the open construction allows free passage of air, the roll



surface is cooled evenly, continuously and efficiently. Heat pockets are eliminated. Normal thermal action keeps the cold water at the bottom, next to the inside face of the roll, while the warmed water rises, and being displaced by the constant current of cold water, overflows the flared end of the cylinder and discharges through a drain pan. The cylinder itself is of all-welded construction with a polished stainless steel face and cast iron spiders for internal support. Drain pan and pillow blocks are supplied as is a removable deflector. Gear or sprocket and roller-chain drive is available from the company if required.

Double-Acting Festoon Compensator

The availability of a new, double-acting type storage festooner has been announced by the Adamson United Co. of Akron, Ohio. Both carriages move vertically and provision is made for stabilizing the carriages in both planes to insure parallelism in operation. The roll supporting structures are of the overlapping type, which



permits "straight through" threading. Tension is applied to the stored fabric by means of a pair of large air cylinders. Various fabric tensions are available to suit specific requirements. Adamson United has built festoons in a range of sizes to provide capacity from 20 to 80 yards, but larger sizes can be provided.

Editorials . . .

Fourth Down, Goal to Go

THE first major step in the possible transition of domestic synthetic rubber production facilities from government to private ownership has been successfully taken. As reported in full detail elsewhere in this issue, negotiations have been concluded by the Synthetic Rubber Facilities Disposal Commission for twenty-five of the twenty-seven plants available for sale, twenty-four on a sale basis and one (the alcohol butadiene plant at Louisville) on a lease basis. The capacity of the copolymer plants involved totals 688,600 long tons of GR-S, considerably above the 500,000 tons-per-year minimum capacity cited in the Disposal Law.

There were very few surprises involved in the final decisions, but there were some. For example, the Shell Oil Company, which operated only a portion of the butadiene facility at Los Angeles, may become an important factor in the over-all synthetic rubber picture. It was the successful bidder for the three plants in the Los Angeles area, namely, the butadiene, styrene and copolymer units. The styrene unit is currently being operated by the Dow Chemical Co. and the copolymer unit by the Midland Rubber Corporation, a subsidiary of the Minnesota Mining & Manufacturing Co. Another surprise was the successful bid of the Food Machinery & Chemical Corporation, which controls Ohio-Apex, a prime supplier of plasticizers, for the butadiene unit at Houston, Texas. The Houston set-up is currently operated by Sinclair Rubber, Inc.

Perhaps the biggest surprise was the failure of the General Tire & Rubber Co. to come to terms with the Disposal Commission on the copolymer unit it operates for the government at Baytown, Texas. Every one of the large rubber companies now operating GR-S plants in the government program concluded negotiations covering such plants, but obviously the General Tire bid was too far below the value set on the Baytown unit by the commissioners. As a member of the Big Five it would prove rather awkward for General Tire to rely on its competitors for synthetic rubber supplies, and accordingly it is suspected that the company has either made arrangements to secure its butadiene rubber from the Polymer Corporation in Canada or has plans ready for the early construction of its own plant.

An effort is currently being made in Congress to have the Disposal Law extended to give General Tire an opportunity to review its position and improve its bid on the Baytown facility. This effort is being sponsored by Rep. Albert Thomas (Dem., Texas) who would naturally prefer to see the production remain in Texas. Under the law, the Baytown facility must be mothballed for a three-year period if the sale of the other facilities is approved by Congress. After the law-required mothballing period, the plant could presumably be disposed of under the surplus war act.

This is truly the fourth down with goal to go. The only remaining step is Congressional approval. Under the law, the Disposal Commission must report the results of its negotiations to the Congress by January 27. Thereafter, Congress has a 60-day period to approve all sales or reject any one or more sales. Since the question of "national security" has been fairly well determined by this time, Congressmen will be faced with two criteria only, namely, whether "full, fair value" has been secured and whether monopoly is involved in any manner, shape or form. It is extremely doubtful whether charges of "give-away" or "monopoly" could be made to stick at this time. Since we have discussed both of these factors frequently in the past we will not dwell further on them now.

As we see it at the moment, the gravest threat to the sale of the facilities to private industry lies in one of the last-minute amendments tacked on to the Disposal Law. This is the amendment which provides that in the event either the House or Senate rejects any one or more bids every other bidder has the right to reconsider and withdraw their own bids within a 30-day period. What is more important is this: In the event sufficient bids are rejected to drop total annual productive capacity below the levels specified in the law, the entire disposal program becomes null and void. The Disposal Commission seems to have no fears on either of these two points. Let's hope they are right.

Highlights Sidelights *of the News...*

January, 1955

The disposal of the government-owned synthetic rubber facilities to private industry entered its final stages when, on December 28, 1954, the Rubber Producing Facilities Disposal Commission announced the signing of contracts for 24 of the 27 facilities involved (page 579) . . . Of the three facilities remaining, one has been leased, while another will go into standby for three years . . . It has been rumored that a Representative from Texas will introduce a bill in the new Congress extending the negotiation period . . . In this way, General Tire will be able to continue negotiations for the Baytown, Texas, GR-S plant, the other unsold facility.

The time for prognostication is at hand and in this issue many of the leading figures in the rubber industry have put their experience and foresight to work in predicting what lies ahead for the rubber industry in 1955 (pages 571-578) . . . Most of the statements were exclusively prepared for publication in RUBBER AGE and these forward-looking and optimistic expressions speak well for the future of the industry.

The government's case against DuPont, General Motors and U. S. Rubber has been dismissed in Federal Court in Chicago, thus ending what was said to be the biggest anti-trust case in history (page 586) . . . The presiding judge ruled that the government had failed to prove its case.

Goodrich-Gulf Chemicals, Inc., jointly-owned by B. F. Goodrich and Gulf Oil, has announced that its scientists have finally succeeded in duplicating the true molecule of natural rubber . . . The indicated cost of the new material will not make rubber plantations obsolete, officials state . . . Patent applications have been filed on the as yet unnamed new material (page 588).

Among the interesting technical meetings which have been held during the past month are the A.S.M.E. Rubber and Plastics Division meeting in New York (page 582), and the Third Annual Symposium on Wires and Cables sponsored by the Signal Corps in Asbury Park, N. J. (page 584).

The Justice Department has informed the group of tire companies fighting the Federal Trade Commission discount ruling that it will seek a summary judgment which, if granted, would throw the case out of court (page 591) . . . The FTC ruling limiting the top discount to the amount offered on a single carload of tires and tubes is not in effect pending outcome of the case.

Review and Preview

A Compilation of Year-End Statements and Particularized Comments on Various Segments of the Rubber Industry Written Especially for RUBBER AGE

General Business Conditions Favorable for 1955

Careful study of past performances and announced plans indicate that American industry will continue at a high level of operation in 1955. Economists are agreed that the gross national product should increase by another $15 billion to $375 billion. The outlay for defense should match 1954's $40 billion. Automotive experts foresee a minimum production of 5.75 million passenger cars (as compared with 5.5 million in 1954). Chemical producers are predicting a 4 per cent drop in capital spending with a 5 to 6 per cent gain in chemical sales. Only slight increases in wages and salaries are expected. Construction activity may reach an all-time high of $39.5 billion. Over-all inventories should reach a $3 billion annual rate by year-end. Some of the more cautious economists predict rising levels for the first nine months and a slight decline in the last quarter. All of this augurs well for the rubber manufacturing industry (see below).

Rubber Industry Foresees Substantial Gains

1955 should prove an excellent year for the rubber industry, approaching (if not meeting) the records established in 1953. . . . Planned increases in motor vehicles (passenger car, truck and bus) speak well for the transportation segment of the field. . . . A gain of 3 to 6 per cent over 1954 should be recorded by the non-transportation segment, particularly for producers of conveyor belting. . . . Still further gains are anticipated for foam rubber products. . . . Industrial betterment will be reflected in upturns for manufacturers of machinery and equipment, chemicals and compounding ingredients, textiles, etc. . . . GR-S plants should be producing at an annual rate of 630,000 long tons by March . . . Consumption of natural rubber in the United States should parallel or exceed 1954. . . . The outlook for reclaim is somewhat brighter and scrap dealers foresee some improvement in demand. . . . Possibilities exist which could make 1955 a record year for consumption of Hevea latex. . . . An over-all increase of 5 per cent in production, consumption and sales is anticipated for the entire industry in the new year.

Higher Production Level.....

P. W. LITCHFIELD

HISTORY may look back upon 1954 as the year that saw our economy conquer the post-war forces which, in the past, have brought on economic depressions. It was a year of transition from war-time to peace-time economy and, instead of the traditional sharp decline, it registered a gross national product within a few percentage points of our all-time high. Perhaps it may be said that 1954 alone is not conclusive, and that a post-war depression has merely been postponed. Certainly we cannot afford to minimize or ignore the hazards, both international and domestic, which continue to present themselves. As potential threats to our economic balance, world tensions remain high and volatile, and great power over our economy has found its way into the hands of special interest groups. But as against these hazards, there are clear indications that sound foundations have been established on which the economy can continue to expand and thrive, and I believe this will be the case.

Present signs point to a higher level of production and employment in 1955 than was the case in 1954. Individual and corporate taxpayers will get a full year's benefit from the 1954 tax revisions. The general level of public confidence is high and, barring serious labor strikes, there are not likely to be any shortages of consumer goods. Competition for markets is on the increase, and activity in the field of scientific research will continue to expand.

In the rubber business, we are anticipating more tire output in 1955 than in 1954. This is largely based on an expected increase in the production of new cars. Moreover, our new lines of tires are confidently expected to enlarge the market. Our large capital expansion in previous years has placed us in position to meet this increased demand.

A general increase in various other lines of our manufactured goods is likewise anticipated. These lines include industrial and aeronautical products, foam rubber, flooring, chemical products, plastics and shoe products. All in all, with a continuation of the improved political atmosphere which carried through 1954, the outlook for 1955 is bright, and the general upward trend should be maintained for some years to come.

P. W. Litchfield

Chairman, Goodyear Tire & Rubber Co., Akron, Ohio.

Predicts Increased Business.....

H. E. HUMPHREYS, JR.

BUSINESS is picking up in the rubber industry and 1955 sales will probably be about 5 billion dollars—or roughly equal to the all-time record set in 1953. The 1954 decline in rubber business turned out to be a mild one. Final figures will show sales off only about 3.7 per cent. We estimate that 1,255,000 tons of rubber will be consumed in the year 1955. That is an increase of 4 per cent. The proportion of synthetic rubber in the total will gradually increase, probably reaching 56 per cent late in the year. The proportion of synthetic had declined to about 50 per cent in the third quarter of 1954.

In tires, we expect a further increase in replacement demand by about 4 per cent. In view of 1955 production forecasts of automobile manufacturers, we also see a market for more tires for new cars and trucks in 1955. Altogether we look for sales of 79 million passenger car tires and 12½ million truck and bus tires, for a total of 91½ million. This compares with about 88 million in 1954 and 94 million in 1953. The United States is rapidly approaching the point where we shall have a car in use for every family. However, this does not mean we are reaching a saturation point. About 30 per cent of American families still do not own cars. Thus, there is still room for advances in tire business, particularly as more families come to drive two cars.

We expect a pick-up in the demand for industrial rubber products, which follows the general level of over-all industrial activity. Foam rubber business continues to advance. In the year ahead we foresee still greater use of this cushioning material in automobiles, furniture and mattresses. As sales of waterproof footwear decline, partly due to recent mild winters, the advancing market for canvas, rubber-soled shoes more than makes up the difference. A growing population, with its increasing leisure time, indicates a bright future for these sport and casual shoes.

The rubber industry expects to take over private operation of the synthetic rubber plants in 1955. The deadline for action by Congress is March 31. Following the transfer, we look forward to even greater improvements in synthetic rubber for the American consumer, under the incentive of free, competitive enterprise.

H. E. Humphreys, Jr.

President, U. S. Rubber Co., New York, N. Y.

Business Outlook Excellent.....

H. S. FIRESTONE, JR.

AS we leave the year 1954, during which tubeless tires were for the first time used as standard equipment on passenger cars, the business outlook for the rubber industry in 1955 is excellent. We at Firestone are looking ahead to the coming year with enthusiasm and confidence. Business prospects for tire dealers during 1955 are very encouraging because the number of vehicles requiring replacement tires will be the largest in history. Approximately 900,000 more passenger cars, trucks and buses will be in the market for replacement tires in 1955 than there were in 1954. This increase will make an approximate total of 32,000,000 passenger cars and 7,600,000 trucks and buses in need of tires during 1955. This indicates shipments of 49,000,000 passenger car replacement tires in the year ahead as compared with 46,900,000 in 1954, and shipments of 8,100,000 truck and bus replacement tires next year as compared with 7,850,000 in 1954. Because of these anticipated increases and an estimate that the automotive industry will make approximately 350,000 more units in 1955 than it did in 1954, employment in the rubber industry should remain at its present high level during the coming year.

More than twelve years ago we began producing tubeless tires for military purposes and, after World War II, we brought out several types of tubeless tires which sold at premium prices. As a result of this long experience, and through efficient production methods, we introduced during the year the first tubeless tire to sell at the price of a conventional tire and tube. This new tire has been acclaimed by automotive engineers as setting completely new high standards of safety, riding comfort, mileage and quiet operation, and it has been adopted as standard equipment on 1955 model passenger cars. The automobile industry has entered a new era, that of the tubeless tire. With respect to cars now in service, this new tire can be applied to present wheels and rims and is being sold for replacement through Firestone dealers and stores.

Consumption of rubber by the industry in the United States was less than in the preceding year, except for natural rubber latex for foamed rubber, which continued its rapid growth and reached a record volume in the month of October. Demand for rubber outside of the United States was the greatest in history because of the growth of motor vehicle transportation and improved economic conditions. The price of synthetic rubber remained stable during the year at 23c a pound, while the price of natural rubber rose from 20c to 28c. Supplies of natural and synthetic rubbers are readily available to meet total world requirements.

In 1953, Congress enacted a law providing for the sale of Government-owned synthetic rubber plants to private industry, a program long advocated by our company. Accordingly we have entered bids for the purchase of the synthetic rubber plants located in Akron, Ohio, and Lake Charles, Louisiana, which we now operate for the Government.

Firestone plant capacity has been materially increased and large-scale improvements were made in processes and equipment for the manufacture of passenger car, truck and earthmover tires; Foamex, the foamed rubber used for mattresses and upholstery; mechanical rubber goods; defense products; reclaimed rubber; Velon plastics, and basic resins for plastics.

Harvey S. Firestone, Jr.

Chairman, Firestone Tire & Rubber Co., Akron, Ohio.

Sees Increased Consumption.....

W. S. RICHARDSON

TOTAL consumption of new rubber in the United States during 1955 should approximate 1,280,000 tons, an increase of about 5% over 1954. The anticipated upturn of production and sales in the rubber industry during 1955 may slightly exceed the increase predicted for general business during the coming year due to mounting automobile registrations and expected high production levels for new cars and trucks. Tire sales for replacement and original equipment will probably exceed 1954 totals by 4,000,000 units. Over-all industry tire sales amounted to about 95,000,000 in 1954. Sales of replacement passenger car tires may be about 2,000,000 more than the 47,500,000 sold during 1954, and total passenger car tire sales, replacement plus original equipment, may increase to 79,300,000 from 1954's sales of about 76,250,000.

Adoption of tubeless tires by automobile manufacturers for use on 1955 models is one of the most significant developments of the year in the rubber industry. The move is a boon to safer motoring, climaxing a pioneering campaign begun by B. F. Goodrich in 1947. In that year, the company announced invention of

the first tubeless passenger car tire and a sixth patent covering another basic feature of tubeless tires was issued to B. F. Goodrich in 1954 by the U. S. Patent Office. Nearly half of the nation's replacement tire sales in 1955 may be tubeless passenger car tires. Seventy-five per cent of the company's passenger car tire production capacity is now assigned to tubeless tires for the original equipment and replacement markets.

The Commissioners, charged with the responsibility of disposing of the Government-owned synthetic rubber plants, have been developing a practical program for selling the facilities to private owners. It is to be hoped that this important segment of the rubber industry, which has been operating under government control and ownership, will be de-socialized during 1955 by a successful sale of the properties to private ownership, action that will be in the long-range interests of our people and the national defense to an extent impossible under continued government ownership of the rubber-making facilities.

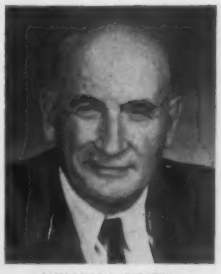
B. F. Goodrich technicians are now in Liberia undertaking preliminary work on a recently-announced company project to engage in rubber-growing there. A long-term concession has been granted the company by the Liberian government involving two separate areas totaling approximately 600,000 acres. B. F. Goodrich, a pioneer in the field of man-made rubber, will become a rubber grower on a commercial scale for the first time.

A major scientific achievement is the reproduction by American scientists of the true molecule of crude, or tree-grown rubber. Announced in December, the actual discovery was made in the B. F. Goodrich Research Center, Brecksville, Ohio, by a research team assigned to the project by Goodrich-Gulf Chemicals, Inc., a company owned half by Gulf Oil Corp. and half by the B. F. Goodrich Co.

W. S. Richardson

President, B. F. Goodrich Co., Akron, Ohio.

Predicts Banner Year.....



WILLIAM O'NEIL

THE late 1954 upsurge in American business should carry over well into 1955, making it a banner economic year for the country. Business will hold to its current high level and perhaps even top the most optimistic predictions. All signs point to increasing consumer demand and a favorable economic climate. Steel production has turned up; car production is spurting ahead of last year, and there's no ceiling on home building. The outlook in the rubber industry is particularly encouraging, with the industry consuming an estimated 64% of the world's rubber production in 1955—an increase of 50,000 tons over 1954. Most of the rubber consumed will be built into passenger and truck tires to carry more people and more freight greater distances over the new superhighways going up across the nation. The trucking industry, also, looks for a promising year, with tonnage and mileage expected to be up over 1954 figures.

As more automobiles are manufactured and stay in service longer because they are built better, the replacement tire market booms. And our Nygen tubeless tire has already gained such public acceptance that we can't foresee anything short of full production for our tire plants for the next 12 months. Plastics, however, offer the greatest growth potential for next year. Our new polyvinyl chloride plant at Ashtabula, Ohio, dedicated two months ago, will be operating at maximum capacity, supplying a large share of the resin to our plastics manufacturing plants at Jeannette, Penna., Marion, Ind., Toledo, Ohio and Lawrence, Mass. With this integrated production set-up, General ranks as the world's largest manufacturer of plastic film and sheeting.

William O'Neil

President, General Tire & Rubber Co., Akron, Ohio.

Textile Field Encouraging.....

W. W. LUFKIN, JR.

IN the field of textiles for the rubber industry, Wellington Sears Company looks ahead to a year that should bring increased activity. Textile sales to rubber manufacturers in 1954 fell short of expectations. While hose duck and V-belt fabrics, for instance, sold in moderate volume last year, there was little demand for belting ducks. Now, however, the outlook for these fabrics is already more promising for the first half of 1955. It is reported, too, that the present high rate of tire production is expected to continue well into 1955, and this would be reflected in increased demand for fabrics for this end-use.

Looking further ahead, such innovations as "moving sidewalks" and other projects, now underway or being considered, might have an important effect on the production of belting fabrics and other textiles. Such developments would tend to place increasing emphasis on the industrial textile manufacturer's role in serving the rubber industry.

The textile industry continues to keep pace with technological progress in rubber manufacturing. While the advent of the tubeless tire had an adverse effect on certain conventional fabrics, at the same time it spurred development of special fabrics for the new type of tire. While cotton continues to be important, fabrics of "man-made" fibers are making news in many ways: nylon and high-tenacity rayon for belts; filament nylon for coated products of many uses; spun rayon for hoses, belts, tires and coating applications. Fabrics, cotton or synthetic—woven, nonwoven or knitted—are finding increasing use for vinyl and other coatings. There can be no doubt that the combination of fabric with rubber and plastics will find wider opportunities for effective teamwork in the future.

W. W. Lufkin, Jr.

President, Wellington Sears Co., New York, N. Y.

Machinery Outlook Promising.....

DONALD A. COMES

THE rubber industry had a good year in 1953 and we, as rubber machinery manufacturers, had a good year with them. The predictions of the experts seemed to be about right in 1953. They predicted 1954 would be a good year but a bit less than 1953 and our machinery business was off about 10%. Looking toward the year 1955, I would think we would at least gain that 10% back and may even do better than that. With the general trend toward more mechanization, shorter batch cycles, automatic loading and automatic handling of various materials, the speeding up of rubber calenders and the higher accuracy in the sheets taken off, all definitely trend toward higher purchase of rubber machinery. There are many new trends in plastics and reclaim as well as in rubber and these three lines all call for allied equipment. Of course, one would not be in sales if his natural outlook were pessimistic, but at least from where I sit at the present moment the future of 1955 for the rubber manufacturers and, therefore, for the rubber machinery manufacturers, seems to be bright.

Donald A. Comes

Vice-President, Farrel-Birmingham Co., Inc., Ansonia, Conn.

Challenging Period for Latex.....

ARTHUR NOLAN

HEVEA latex during 1954 again surpassed all its previous records of production and consumption and established new highs. "Foam" still grew at a much faster rate than other latex products and so accounted for practically the entire increase. Whereas an estimate of 1953 consumption apportioned 74% of Hevea latex and 54% of synthetic latex to U.S.A. foam use, during 1954 higher percentages were apparent. The 1954 world Hevea latex production figure will probably approximate 145,000 tons, about half of which will have been imported into the U.S.A. During 1954 the U.S.A. relied upon its accumulated stocks to support its deficit between imports and consumption. World consumption in 1954 appears, at this writing, to be near 140,000 tons, of which about 60% will have been used in the U.S.A.

Similarly, synthetic rubber latices reached new highs in production and consumption, with U.S.A. leading in both production and consumption. Total production in the U.S.A., all synthetic rubber types, but excluding plastic types, when tabulations are complete, will approximate 68,000 tons. GR-S types are lowest in price and account for perhaps 75% of the total production. Consumption closely approaches production, since stock positions were established years ago and vary only slightly from period to period because of the need for special tank storage.

With the coming of 1955, there are strong indications that it will be even larger than previous record years. New foam producing capacity was added in 1954, and not fully utilized, and still additional capacity will be completed early in 1955, making consumption possibilities for 1955 much larger than 1954.

Production capacity for both Hevea and synthetic latices during 1954 was not utilized to the full so it is reasonable to presume, with proper advance notice, 1955 requirements can be met. The only evident dangers would stem from: (a) a price situation in Hevea latex where it becomes so high as to price itself out of the market; (b) advance notice of requirements were not firmly established in time, and (c) some confusion resulting from synthetic latices production facilities being transferred to private hands and appropriate coordination of GR-S latex production not quickly achieved.

Prices will influence, to a very large extent, the shares of the total market to be enjoyed by synthetic rubber types and Hevea latex. There is the expectancy that certain special types of GR-S latex, including those used in foam, must be substantially increased in selling price under private ownership of government production facilities.

A more important consideration for 1955 will be the price level at which latices will sell, for it is this factor which determines latex products' ability to compete with alternate goods. This is, of course, most easily understood when one recognizes foam as cushioning, for which there are alternates, such as hair, cotton, jute and similar paddings, together with metal springing arrangements. The most recent experience of the loss of foam markets was when Hevea latex rose to 84½c per pound during G.S.A. operation of the latex stockpile during 1951. Whereas Hevea latex is replaced by GR-S latex when Hevea ranges above 35c, foam cushion generally is displaced when its selling price becomes much costlier than alternates. However, certain foam rubber uses remain, with substantial quantities of both latices used, even when prices increased substantially as they did in 1951.

Plastic foams, of the styrene, vinyl and/or isocyanate types, both rigid and flexible, while finding new uses and markets, have not yet replaced foam rubber to any great extent, and are not expected to do so in the near future.

Prices of latices during 1954 ranged from 28c to 40c for Hevea and 21.5c to 28c for GR-S; the latter's spread prices being largely due to different prices for different types. Neoprene and acrylonitrile type latices prices are higher than GR-S latex prices and vary with the specialized types.

While it is impossible to predict with any degree of dependable accuracy, the price at which natural rubber will sell during 1955, and as there does not now seem to be any downward tendencies, it is reasonable to expect that Hevea latex may sell for between 38c and 45c per pound solids during the first quarter of 1955. During the coming year, GR-S latices, if their production facilities are sold by the government, may have price rises of 2c to 8c per pound.

All in all, the latex industry, throughout the world, and in the U.S.A. more than elsewhere, is one of very rapid growth, the impetus of which has not yet shown signs of diminishing. In particular, synthetic and plastic latices will bring new uses and markets of great merit. These will doubtless raise standards of living throughout the world. It is an industry still filled with technical and economic challenges. It has an interesting background of technical advances and hectic economic peaks and valleys. Its participants can feel justly proud and view its future with enthusiasm.

Arthur Nolan

Vice-President, Latex & Rubber, Inc., Baltimore, Md.

Synthetic Demand to Rise.....

E. D. KELLY

THE operation of the Government synthetic rubber program since its inception in 1942 can probably best be characterized as a "feast and famine" business. Nineteen hundred and fifty-four was no exception. Sales during the first half of the year showed a steady decline. During this time the operating plants were producing at about 60 per cent of capacity. Business for the last half of the year showed a marked improvement, resulting in total GR-S sales of 495,000 tons and Butyl sales of 63,000 tons. Oil-extended GR-S continued to be consumed in larger quantities and represented almost 35 per cent of total sales by the last quarter in the year. Nineteen hundred and fifty-four was the first year in which a new advance order system was fully effective. This system requires large consumers to place firm orders approximately 90 days in advance of delivery. This system has been very beneficial as an aid in projecting the volume of sales and has permitted plant operations to be scheduled on a more even basis than would otherwise have been possible.

Butyl rubber sales have habitually been steadier than GR-S. The decline in sales of Butyl rubber during the first half of 1954 was not nearly as severe as GR-S. Similarly, there was relatively little increase in Butyl business in the last half of the year. The introduction of the tubeless tire on practically all new model automobiles undoubtedly reduced Butyl sales from the volume it would otherwise have enjoyed. Current indications are that natural rubber prices will remain on the high side during the foreseeable future. This will create a greater demand for GR-S synthetic rubber in 1955.

Production is being rapidly stepped up to keep pace with sales. The operating plants will be producing at an annual rate of approximately 630,000 long tons per year early in 1955. Production can be further increased if the demand increases beyond that currently anticipated. The potential sale of the synthetic rubber plants to private industry may result in some abnormal purchases of GR-S early in the year for inventory purposes. In any event, a program is being developed which will provide ample stocks of synthetic rubber regardless of whether the production is in the hands of Government or private industry.

E. Dorrance Kelly

Director, Office of Synthetic Rubber, Federal Facilities Corp., Washington, D. C.

Tire Industry Outlook Good.....

J. P. SEIBERLING

FOR 1955, the outlook for the tire industry is good. Increased sales are indicated both for the new car tire market and the replacement market. Greater production of new cars and trucks in 1955 means that the automotive industry will need more original equipment tires—about 1,100,000 more than the 31.7 million estimated to be delivered in the year of 1954. For the replacement market, the outlook also is good, although no new sales records will be set. The all-time peak years were 1946 and 1947, when the industry was satisfying pent-up demand from the war years. The next best year was 1950, when about 56.8 million replacement tires were sold. In 1955, we should sell about 56.3 million replacement tires—about a half million short of the 1950 mark, but almost three per cent more than this year's sales. The big increase should come in the passenger tire field. We expect the industry to sell about 48.3 million replacement passenger tires next year, compared to about 47 million in 1954. There will be nearly 34 million cars two years old or older on the roads. Although this is a tremendous potential market, not all of it can be translated into sales, because today's tires last longer and need replacing less often.

As for the truck and bus tire replacement field: In this market the rubber industry should sell at least 8 million units, against an estimated 7,780,000 in 1954. This increase is predicted by the improved economic situation as we move into the new year. More trucks will be on the highways, transporting goods to fill the growing demand of an expanding economy. Here again, however, the full potential replacement market has been reduced by technological improvements. Today's truck tires are much better than those of three or four years ago, and should give improved service.

The export market looks better for 1955, because many foreign countries have strengthened their economic position, and will be using more tires and tubes as their level of economic activity moves upward. The price levels of tires and tubes should move appreciably upward in 1955 not only because of higher labor and material costs which took effect in the last quarter of 1954, but also because a violent price war raged throughout most of the year. This reduced prices to unprofitable levels that cannot be continued much longer. In general, I believe the year 1955 will be a year of considerable improvement over 1954 in the rubber manufacturing industry.

J. P. Seiberling

President, Seiberling Rubber Co., Akron, Ohio.

Rising Consumption Seen.....

E. J. THOMAS

I look for the rubber industry to continue its high-level contribution to the national economy in 1955. It should be a good year—better than 1954—in terms of rubber consumption, employment, payrolls, in sales of tires and other rubber products. Consumers will benefit in greater service from these products. All indications are that there will continue to be a sound and healthy expansion of the American standard of living and the free enterprise system. We have these factors in our favor: Increases in population, high employment and wages, and a high level of consumer confidence, reflected in their willingness and ability to buy goods. The mild recession which started in mid-1953 was the most orderly adjustment from a war- to a semi peace-time economy in the history of our country, and with much less unemployment than had been anticipated.

Rubber consumption—the most reliable barometer of the industry—is expected to be 1,260,000 long tons, compared with 1,210,000 long tons in 1954, and 1,335,000 long tons in the record year of 1953. Total tire production is estimated at 96 million units for 1955, compared to about 61 million in the prewar year of 1940. It is conservatively estimated that new passenger car production will be 5,600,000, and might possibly go as high as 6,000,000, which would match the output of 1950 and 1953.

Public acceptance of the entirely new tubeless tire announced by Goodyear in 1954 was most gratifying. Most new automobile models will be using tubeless tires in 1955, and we have a heavy demand from dealers for tubeless units for the replacement market. The 1955 tire offers the consumer more miles per dollar than ever before.

Rubber products for the non-transportation field should enjoy an increase, too, in line with increased industrial activity for 1955. Foam rubber, films, chemical and plastic products, flooring, and shoe products should all share in the upward trend.

The supply of new rubber should be adequate for our needs in 1955. The road-building program shows signs of speeding up, but there is much to be done to keep our traffic arteries open. America should march forward to new heights of prosperity if we work together and keep our nation strong against the threats of aggression.

E. J. Thomas

President, Goodyear Tire & Rubber Co., Akron, Ohio.

Small Natural Excess Seen.....

H. C. BUGBEE

IN an endeavor to provide estimates of demand and supply for the preceding and forthcoming year, we are faced with the two normal imponderables: (a) the trend of general world business; and (b) the actual and emotional results of the fluctuating cold war along the China Coast and Southeast Asia. The new element, of course, is the eventual destiny of the U. S. Government-owned synthetic rubber plants. From the supply/demand angle alone, however, any production lost during the transfer period should be fairly promptly compensated for in a matter of a few months. If disposal is nullified by Congressional politics (and we feel this unlikely) then the Government will continue as usual to meet manufacturers' demands.

Our estimates for 1954 show an excess of supply over consumption demand of 45,000 tons in natural rubber and a deficit of 20,000 tons in synthetic rubber (from stocks) or a total world net excess of 25,000 tons over demand. Obviously this is too small an excess to have any depressant effect on the market and in fact has had the reverse effect.

As expected, the calculated increase in the U. S. stockpile of natural rubber amounted to only 3,000 tons for the first nine months of 1954, indicating that the Government's total tonnage objective has already been met. For 1955, we estimate only a 20,000 ton margin of world supply over world demand for natural and a balanced position in synthetics. This small excess could quickly be eliminated by a decrease in production, stepped up consumption or a combination of both.

H. C. Bugbee

President, Natural Rubber Bureau, Washington, D. C.

Non-Tire Segment Confident.....

THOMAS ROBINS, JR.

THE production of non-tire rubber products in 1955 should gain from 3 to 6 per cent over 1954. Indications are that the 800 companies making rubber products other than tires will consume about 465,000 tons of rubber, or 36 per cent of the industry total. Consumption in 1954 was about 440,000 tons. The products in which this rubber will be used include conveyor belting, hose, foam rubber, gaskets and packing for machinery, sponge rubber carpet cushioning, floor tiling and heels and soles. The outlook is especially good for conveyor belting. Mines, mills and factories almost every day are discovering new ways to cut costs and streamline production by the use of belt conveyors. The science of automation is stimulating that trend. In addition, world-wide interest is focused on newly-developed methods of conveying people on continuous belts in congested urban areas. The "passenger conveyor" industry should grow rapidly in the years to come.

Another product with a particularly promising outlook in 1955 is foam rubber cushioning, which has enjoyed rapid growth during the last decade and shows no signs of leveling off. The seats in 1955 model automobiles are being made with more foam than previous models and foam is also being used as padding on the doors and other interior surfaces. The furniture industry, which used more foam in 1954 than ever before, is expected to increase this usage even more in the coming year.

The profit margin on many rubber products in 1954 was extremely low as the result of intense competition which forced selling prices down while at the same time the cost of doing business increased because of higher charges for labor, transportation, plant equipment and raw materials. In view of the low prices currently prevailing and the continued high cost of doing business, I do not look for any appreciable decline in selling prices during the coming year. In fact, the tire makers have recently raised their prices and we expect the makers of other rubber products will find it necessary to follow a similar course in the immediate future.

Thomas Robins, Jr.

President, Hewitt-Robins. Inc., Stamford, Conn.

Reclaim Demand Brightening.....

GILBERT K. TRIMBLE

THE past year has not been outstanding for the rubber reclaiming industry. As a matter of fact, if it were not for the surge of business in the last quarter of the year, it would have been a year much below normal for the period since the beginning of the second World War. Consumption at close to 250,000 tons will be 35,000 tons lower than in 1953. The magnitude of automobile production, after model changes were made, was a stimulating influence on the use of our product since approximately 85% of all the reclaimed rubber used in America goes into the automobile in the tires, floor mats, hard rubber battery cases, and in many other parts. Price differences between new rubber and reclaimed rubber greatly influences ratio of use. The 50% increase in the price of number one smoked sheets during 1954, and the narrowing of price differentials toward the end of the year between best and lower grades of natural rubber has made the use of reclaimed rubber much more attractive.

At the beginning of 1955, the demand for reclaimed rubber looks better than for 1954. This, of course, depends upon the fulfillment, for the most part, of the optimistic predictions coming out of Detroit. It also depends a great deal on better than early 1954 prices for natural rubber and the same or better prices for synthetic rubber during the year. I think, however, we should expect to see not less than the 280,000 to 285,000 tons consumption which we had in 1952 and 1953.

The reclaimers face many problems. Labor costs constitute a large percentage of total cost of producing the product, and are increasing. The possibility of substitution of other lower priced competitive elastomers for reclaimed rubber is an ever-present threat. The demand for high quality finished products calls for increasingly better grades of reclaimed rubber and requires constant modernization of processing methods. The industry has a penchant for overcoming obstacles, however, and is ready in 1955, as it has been in the past, to supply a completely satisfactory rubber in large tonnage for fabrication into the many articles so necessary to our way of life.

Gilbert K. Trimble

President, Midwest Rubber Reclaiming Co., East St. Louis, Ill.

Plastics Usage Increasing.....

GEORGE C. MILLER

THE use of plastics by American industry in 1954 should equal and probably will slightly exceed the record usage of 1953. Plastics usage for 1954 will exceed 3,000,000,000 pounds for the second straight year. This continued high rate of usage of plastics, despite lower over-all business activity, was the result of broader usage of many types of plastics. Also, the past year saw greater availability of some of the new plastics such as polyethylene. New and beneficial uses for plastics are constantly being discovered, stimulating new growth in almost every industry in the United States. At the same time, the growth of older and more established uses reflects a trend toward proper application for the proper plastic.

Polyethylene, the rapidly rising star of the plastics industry, will finish the year with a new record high of approximately 220,000,000 as compared with only about 130,000,000 pounds in 1953. Most notable increases in the consumption of polyethylene were broader use of film for packaging fresh fruits, vegetables, meats, poultry, textiles, hardware and for drum liners; the growing trend in polyethylene housewares; greatly increased use of polyethylene pipe for water supply; expanding use of polyethylene for wire and cable insulation. Increased plastics application in auto production, housing and electronics will aid greater sales for the plastics industry.

The automotive industry is using epoxy plastics for tooling to save time and reduce unit costs. Such uses of plastics in automobiles as upholstery and safety glass show sharp increases because of new designs that call for more upholstered areas and greater areas of safety glass that has plastic sandwiched between two layers of glass. The average 1955 automobile calls for about 33 square feet of safety glass as compared with only about 26 square feet in 1954.

In the building field, plastics were used in broader application for floor tile, decorative laminates (kitchen counter and table tops), wall tile and other plastic coated wall coverings, paints and coatings, wire insulation and luminous ceilings. In addition to heavy consumption of these materials for new buildings, the do-it-yourself program also created heavy demand. Plastics continued in high use for electrical appliances of all sizes and types in molded component parts as well as for wire and cable.

Reinforcing plastics with glass, natural and synthetic fibers, cloth and other materials is credited with opening up entirely new fields for industrial design.

The past year has been a period of general shaking down in the plastics industry, which has resulted in better selection of materials for specific uses. It is expected that the entire plastics industry will stand on a firmer basis during 1955, with greater gains in application of plastics for industrial and consumer uses.

George C. Miller

President, Bakelite Company, New York, N. Y.

Cites New Advances . . . . .

JOHN R. HOOVER

NEW advances in the application of man-made chemicals to upgrade textiles and paper rank among the most significant 1954 achievements of B. F. Goodrich Chemical Co. In some instances, the use of Hycar nitrile latex has given a "second wind" to basic natural products and industries that were feeling intense competition from synthetic fibers. Other major chemical developments made by the company during 1954 included work in the field of processing high-impact rigid Geon plastics, vinyl foam, new synthetic gelling agents, poultry feed additives, new color pigments, and the use of a recently discovered basic insecticide as a moth-proofing agent. One outstanding application of Hycar latex as a permanent size shows promise of putting denim fabrics into the higher quality markets where they have never been before. Hycar treated denim won't fade or run and will resist wear as much as fives times better than conventional denim. Other types of cotton goods can be treated to improve wear, wrinkle resistance and color retention. Hycar can also be used to upgrade wool and rayon and other chemicals have been developed to improve cotton, rayon, nylon, acrylics and jute.

Hycar is being used in the production of many special papers to achieve toughness, softness, good drape and resistance to oil, solvents and water. Such papers are used for gasketing, shelf coverings, imitation leather base materials, tape backing and packaging.

The development of rigid Geon vinyl resins which have outstanding impact strength, good physical properties and chemical resistance will bring this plastic directly into competition with such established materials as wood, steel, glass, aluminum and copper. We believe there is an excellent future for rigid vinyl as siding and roofing for homes and factories, pipe and tubing, window frames, molding, baseboards, wainscoting and paneling.

B. F. Goodrich Chemical Co.'s development of a process in the past year whereby rigid Geon vinyl products can be made on conventional metal stamping machines opens the field of plastics to metalworking manufacturers. The process makes possible the relatively simple and fast forming of products which heretofore had not been made of vinyl because previous production methods were too slow and too costly.

Production of vinyl foam sponge is one of the most promising applications of Geon plastisols. Mattresses, pillows, home and office furniture, automobile arm rests and cushions are among the present or immediate future uses for expanded vinyls. Vinyl foam sponge is non-flammable, unaffected by oxygen or ozone, practically odorless and highly resistant to most solvents and chemicals. In addition, the properties of this type of vinyl can be altered easily to meet the requirements of special applications.

Goodrich Chemical Co. during the past year developed a unique group of hydrophilic colloids, or gel-forming materials marketed under the name of Goodrite Carbopol which show great promise as thickening agents, suspending agents and anti-caking agents for cosmetics, pharmaceuticals, paints, inks, textile and agricultural chemicals, latices and other products containing water.

A new series of organic color pigments marketed as Harmon Indo Colors were developed in response to the ever-increasing public demand for brilliant pastel shades created by automotive color stylists. The new colors exhibit exceptional lightfastness and brilliance under severe weathering conditions even in the very light pastel shades in which the pigments are reduced fifty to one with titanium dioxide.

The company's $8,500,000 acrylonitrile project in Calvert City, Kentucky, begun early in 1953, is scheduled for completion in the spring of 1955. This new plant will produce raw materials for Hycar oil-resistant rubber, plastics and textiles. Operations of the overseas associated chemical companies were characterized by steady growth during the past year. New Geon resin plants at Sao Paulo, Brazil, and Mexico City are scheduled to start production in January of 1955. Japanese Geon Co., Ltd., built in 1952, is operating at capacity and is considering plans for further growth. The oldest of the overseas vinyl companies affiliated with B. F. Goodrich Chemical Co., British Geon, Ltd., is currently expanding its capacity to almost double its 1953 rate.

John R. Hoover

President, B. F. Goodrich Chemcal Co., Cleveland, Ohio

Carbon Black Outlook Good . . . . .

J. M. HAMILTON

SINCE over 90% of the carbon black output is consumed by the rubber industry, sales and production forecasts must be related to rubber consumption data and the automotive outlook.

As would be expected, 1954 carbon black sales declined from the previous year. Domestic shipments were off about 12%, exports up about 20%, with over-all usage off 6%. It is expected that in 1955, shipments to overseas markets will be about the same as in 1954, but that domestic movement should increase in the neighborhood of 5%. Fifteen years ago, practically all carbon black was made by the channel process. Today, about two-thirds of the carbon black used is produced by the various furnace black processes, using gas, oil, or combinations as raw material. The rate of the trend toward furnace blacks has slowed during the past year, although it has not stopped. It is likely that channel black will decline to about a 25% position over the next year or two, and be stabilized at about that ratio over the next few years. Industry furnace black capacity is at present in excess of expected demand for at least the next two years. Although inventories of channel black, produced entirely from natural gas, have been declining during recent months, present inventories represent about five months supply, and with the trend toward furnace blacks still continuing should represent an adequate cushion.

There were no price increases in 1954 while there were some decreases in the comparatively new higher abrasion resistance furnace blacks, which have recently gained consumer acceptance resulting in increased production and lower costs. As oil and gas prices continue to rise so must costs of established carbon black grades which have reached production efficiency through volume. Although no general price increases are expected in the early part of 1955, some upward revisions may be necessary during the year. Although the carbon black industry, along with the rubber industry, showed lower volume in 1954, the trend should reverse in 1955, and along with our rubber associates we expect an upward pattern for the next several years.

J. M. Hamilton

Vice-President, Binney & Smith Co., New York, N. Y.

Wire Industry Looks Ahead.....

R. A. SCHATZEL

1954 has been marked by extreme competition in the wire industry. This has been due in part to a drop in Government business, an expectation of a decrease in price of copper which did not materialize, and reduction of customers' inventories. These have caused instability of prices and a decline in volume and profits, greater in the wire industry than industry generally. Technological competition between rubber and plastics has been keen, and advances have been made by both. GR-S continues to dominate in rubber, while Butyl is forging ahead to compete both with other types of rubber and varnished cambric. Plasticized polyvinyl chloride insulation has advanced to dominate the field of building wire, machine tool and appliance wiring.

Polyethylene has found greater acceptance in its competition with neoprene for weatherproof wire, and has firmly established itself in the communication field. It is now entering the field for higher voltage insulation. The twin hurdles of space and temperature have called on the chemical industry with increasing frequency for thin film and high-temperature insulation. Silicone rubbers are advancing the temperature horizon.

1954 has been one of uncertainties in supply and price, but one of technical progress. 1955 should be better. It is expected to be one of severe competition. We expect GR-S to continue as the preferred rubber and the transfer of manufacture to private hands will hasten developments to make its position more secure. Butyl rubber is firmly established and its use will be greatly increased in both the high-voltage and low-voltage fields.

We look for a continuation of the application of plastics in the low-voltage power field, as well as for control and communication cables. A higher volume of business at lower costs made to satisfy a greater variety of requirements should mark 1955 as a milestone in the progress of the wire industry and through it, the electrical industry.

R. A. Schatzel

Vice-President, Rome Cable Corp., Rome, N. Y.

Economic Outlook Good.....

A. C. MARTEL

WHAT are the prospects for the new year? The outlook for the rubber industry is good in keeping with forecasts for the entire economy. There was a noticeable upsurge in activity in the fourth quarter of 1954. The automotive industry picked up nicely, the new models are being enthusiastically received and statistics indicate continued strong replacement tire demand, all of which bodes well for the tire manufacturer. Price increases announced by several tire producers should offset rising crude rubber and wage costs, thereby taking some of the squeeze off profits. Economists are predicting a 5% increase in the gross national product in 1955. With rubber appearing as an important component in many fields, it is very likely that the year should closely parallel 1953 or even surpass it in production and income.

There are, of course, some cross currents. 1954 saw the adoption of the tubeless tire as original equipment by a number of the major automobile producers and it is expected that usage of this innovation in the industry will increase. All of which poses a problem in tube production and finding suitable substitutes to offset the probable decline in demand for this product. This is not, however, of major consequence. Versatility and progress have long served and will continue to serve well the men who make up and lead the rubber manufacturing industry.

1955 is also the year in which the sale of the Government owned synthetic plants is scheduled to take place. The first contracts have already been signed; however, the terms of sale have not been released. Just how and when this issue will be settled finally is still a matter of conjecture. Doubtless the terms will include recapture clauses and safeguards against abuses. Therefore, one can only assume industry benefit will ensue with the establishment of private control.

When the final figures are all tabulated, 1954 will go down on record as being another excellent year for the rubber manufacturing industry. Volume and production will fall short of 1953 but not by much. Accompanying the lower automobile production, shipments of tire casings for the first nine months declined to 69,822,282 units compared with 76,357,969 units for the same period in 1953. This decline was also reflected in consumption figures. Synthetic usage declined 27% while natural rubber usage increased 3%, leaving a net decline of 15% or 115,117 long tons. Reclaimed rubber followed the pattern, off 20% for the period. The reduced production and consumption was, in part, a result of labor unrest in the industry with plant shutdowns ranging from 30 to 90 days and longer in July, August and September. The labor disputes were finally settled with the granting of wage increases and additional fringe benefits. Despite declining sales and increased expenses, profits have held up remarkably well. A number of interim statements reviewed showed earnings off moderately in most cases with slight increases in others as a direct result of the elimination of Excess Profits Taxes for 1954.

A. C. Martel

National Credit Office, New York, N. Y.

Sees Better Scrap Demand.....

H. MUEHLSTEIN

THE demand for scrap rubber during the year 1954 continued at a low level, although some improvement in demand was evidenced in the latter months. Prices applying to the major item of scrap, which is scrap tires, prevailed at a depressed level, hardly covering the costs of transportation and handling. In spite of this, it is amazing to note that an estimated 225,000 tons will have been delivered to the reclaiming mills during 1954. During 1955, with the probable return of the synthetic rubber industry to private hands, natural competitive economic forces may come into play creating perhaps a little better demand for scrap rubber and its resultant product, reclaim. The importance of scrap rubber as a stabilizing influence in our economy has been demonstrated on several previous emergency occasions, notably during World War II and the Korean War. In addition to its economic impact, it has been a necessity during periods of shortage of rubber hydrocarbon. This was ably demonstrated when rubber hydrocarbon generated from scrap bridged the gap between natural and synthetic rubber during World War II.

The synthetic rubber industry has progressed by leaps and bounds over the past few years. Many new types of material have been developed and are being used in increasing quantities, which has not helped the usage of scrap. It is also expected that many of these specialized materials will be present in the scrap rubber field in increasing quantities during 1955. This will entail an ever increasing technical effort in order to utilize these products to best advantage. With this in mind, men of foresight in the rubber industry should devote serious thinking to the increased usage of this almost inexhaustible domestic source of rubber hydrocarbon.

H. Muehlstein

President, H. Muehlstein & Co., Inc., New York, N. Y.

NEWS REPORTS and Industry Activities

DISPOSAL NEGOTIATIONS END ON DECEMBER 27 WITH SIGNED CONTRACTS FOR 24 FACILITIES

ON December 28 the Rubber Producing Facilities Disposal Commission announced that at the end of the negotiation period (midnight December 27) contracts had been executed for the sale of twenty-four of the twenty-seven plants comprising the government's synthetic rubber producing facilities. Of the three plants which remain unsold, one is the copolymer plant at Institute, West Va., for which no bid was received; one is the copolymer unit at Baytown, Texas, for which no satisfactory bid was received, while the other unit, an alcohol-butadiene plant at Louisville, Ky., has been leased to Publicker Industries, Inc.

Facilities sold are capable of producing 688,600 long tons of GR-S and 90,000 long tons of Butyl annually. Minimum requirements set up by Congress in the disposal legislation are 500,000 long tons of GR-S and 43,000 long tons of Butyl. The accompanying table spells out the current status of the government-owned synthetic rubber producing facilities, and readers are urged to consult this table as a ready reference.

The next step in the disposal timetable calls for the Disposal Commission to submit its contract recommendations, along with those of the Attorney General, for Congressional review. This must be done by January 31, 1955. Within sixty days from that date, the Congress may reject these recommendations in whole or in part. If any specific bids are rejected, bidders holding other contracts may withdraw.

On April 30, 1955, contracts neither vetoed nor withdrawn become effective, provided the over-all minimum tonnage requirements for both GR-S and Butyl are met.

Copolymer Plants Sold

Few surprises were noted in the final announcements of signed contracts for copolymer units. Firestone contracted for the 30,000 long ton GR-S unit it has been operating for the government at Akron, Ohio, as well as for the 99,600 long ton unit it has been operating at Lake Charles, La.

Goodyear Synthetic Rubber Corp., operating company for the Goodyear Tire & Rubber Co., signed for the 15,200 long ton unit in Akron and the 99,600 long ton unit at Houston, Texas. The Copolymer Corp. signed a contract for the 48,000 long ton plant at Baton Rouge, La., and Phillips Chemical met Disposal Commission terms for the plant it has been operating at Borger, Texas, this plant having a capacity of 63,000 long tons of GR-S a year.

Shell Chemical Corp. aranged for the purchase of the 89,000 long ton GR-S plant at Los Angeles, Calif., the plant now operated by the Midland Rubber Co. As expected, the American Synthetic Rubber Corp. successfully negotiated for the 44,000 long ton GR-S plant operated for the government by the Kentucky Synthetic Rubber Corp. at Louisville, Ky.

U. S. Rubber signed for the purchase of the 22,200 long ton plant at Naugatuck, Conn., and the 88,000 long ton plant at Port Neches, Texas. Goodrich-Gulf Chemicals, Inc., a company jointly owned by the B. F. Goodrich Co. and the Gulf Oil Co., signed for the 90,000 long ton GR-S plant at Port Neches, Texas. This plant has been operated by the B. F. Goodrich Chemical Co., a subsidiary of B. F. Goodrich.

It should be noted that American Synthetic is jointly owned by 29 participating companies, fourteen of which presently participate in the management of the Kentucky Synthetic Rubber Corp. The only other joint purchaser is the Copolymer Corp. which is composed of seven smaller tire manufacturers and Sears Roebuck & Co.

There had been no expectation that the 122,000 long ton GR-S plant at Institute, West Va., would be sold. This plant, formerly operated by Goodrich Chemical, has been in standby since September, 1953. Under the disposal law, unsold plants are placed in standby for a period of three years, at the end of which time they may be sold.

As to the remaining GR-S plant, the 44,000 long ton unit at Baytown, Texas, a spokesman for the Disposal Commission stated that "no satisfactory bid was received" for the plant, which has been operated for the government by the General Tire & Rubber Co.

Government officials have advanced two reasons for the failure of General Tire and the government to come to terms on the sale of the Baytown plant: (1) General Tire could only have used about one-half the GR-S the plant would produce. To dispose of the remainder, it would have to compete with Phillips Chemical and Shell Chemical; (2) General Tire could not reach an agreement with Humble Oil. Humble has signed for the butadiene plant at Baytown, and made arrangements with another firm for the sale of its end product.

Adjusted Plant Capacities

It is interesting to note that the final contracts signed by the Rubber Disposal Commission altered, somewhat, the capacities previously accepted for several of the plants. The Disposal Commission states that some differences in plant capacities were adjusted in contract negotiations because original government figures and operating company figures were often at variance. It had long been accepted that the total GR-S plant capacity was 860,000 long tons. Final figures showed the capacity to be 854,600 long tons. With the unsold 122,000 long ton Institute plant and the 44,000 long ton Baytown plant, plant capacity contracted for sale amounts to 688,600 long tons of GR-S, well above the 500,000 long ton minimum prescribed by law.

Both Butyl plants now in operation were sold to the present operators. Esso Standard Oil Co. purchased the 47,000 long ton unit at Baton Rouge, La., while Humble Oil bought the 43,000 long ton unit at Baytown. The total plant capacity of 90,000 long tons for these two plants meets the minimum requirement of 43,000 long tons set up under the disposal law.

Petroleum-Butadiene Plants

All the petroleum-butadiene plants were sold. Copolymer Corp. bought the 23,000 short ton plant it has been operating for the government at Baton Rouge, La., while

STATUS AND PERTINENT DATA ON SALE OF THE GOVERNMENT-OWNED SYNTHETIC RUBBER PRODUCING FACILITIES

Location	*Capacity*	*Present Operator*	*Purchaser*	*Cost at [a] Jan. 1, 1946*	*Cost at [b] Dec. 31, 1952*	*Net Book Value at Dec. 31, 1952*
GR-S Plants						
Akron, Ohio	30,000 LT	Firestone	Firestone	6,262,000	7,630,000	3,041,000
Akron, Ohio	15,200 LT	Goodyear Synthetic	Goodyear Synthetic	7,463,000	8,186,000	3,550,000
Baton Rouge, La.	48,000 LT	Copolymer	Copolymer	6,956,000	9,276,000	4,148,000
Baytown, Texas	44,000 LT	General Tire	N. S.	7,786,000	9,983,000	5,404,000
Borger, Texas	63,000 LT	Phillips Chemical	Phillips Chemical	8,690,000	10,438,000	4,664,000
Houston, Texas	99,600 LT	Goodyear Synthetic	Goodyear Synthetic	12,870,000	15,246,000	7,242,000
Institute, W. Va.	122,000 LT	Goodrich Chemical *	N. S.	17,852,000	18,387,000	7,471,000
Lake Charles, La.	99,600 LT	Firestone	Firestone	12,470,000	15,846,000	7,697,000
Los Angeles, Calif.	89,000 LT	Midland Rubber	Shell Chemical	15,248,000	15,822,000	7,759,000
Louisville, Ky.	44,000 LT	Kentucky Synthetic	American Synthetic	6,572,000	8,932,000	4,298,000
Naugatuck, Conn.	22,200 LT	U. S. Rubber	U. S. Rubber	9,200,000	10,123,000	4,078,000
Port Neches, Texas	90,000 LT	Goodrich Chemical	Goodrich-Gulf	19,532,000	21,664,000	9,694,000
Port Neches, Texas	88,000 LT	U. S. Rubber	Texas-U. S. Rubber	11,334,000	14,326,000	7,277,000
Total GR-S	854,600 LT			142,235,000	165,859,000	76,323,000
Butyl Plants						
Baton Rouge, La.	47,000 LT	Esso Standard	Esso Standard	25,387,000	28,491,000	9,378,000
Baytown, Texas	43,000 LT	Humble Oil	Humble Oil	25,330,000	24,690,000	8,226,000
Total Butyl	90,000 LT			50,171,000	53,181,000	17,604,000
Petroleum-Butadiene Plants						
Baton Rouge, La.	23,000 ST	Copolymer	Copolymer	8,973,000	7,711,000	1,470,000
Baytown, Texas	49,000 ST	Humble Oil	Humble Oil	18,201,000	18,772,000	3,899,000
Borger, Texas	71,200 ST	Phillips Chemical	Phillips Chemical	35,410,000	42,239,000	11,676,000
El Segundo, Calif.	[c]	S. O. of Calif.	S. O. of Calif.	7,834,000	7,862,000	1,159,000
Houston, Texas	78,000 ST	Sinclair Rubber	{Food Machinery} {Tennessee Gas}	29,964,000	31,547,000	8,258,000
Lake Charles, La.	60,000 ST	Cities Service	Petroleum Chemical	16,509,000	17,703,000	3,704,000
Los Angeles, Calif.	61,000 ST	Shell Chemical	Shell Chemical	19,312,000	20,281,000	4,061,000
Port Neches, Texas	197,000 ST	Neches Butane	{Goodrich-Gulf} {Texas - U. S.}	54,465,000	58,357,000	12,028,000
Total Pet.-But.	539,200 ST			190,668,000	204,472,000	46,255,000
Alcohol-Butadiene Plants						
Kobuta, Penna.	128,000 ST	Koppers	Koppers	48,638,000	45,553,000	12,676,000
Louisville, Ky.	87,000 ST	Union Carbide	Publicker [d]	34,142,000	31,289,000	9,455,000
Total Alc.-But.	215,000 ST			82,780,000	76,842,000	22,131,000
Total Butadiene	754,200 ST			273,448,000	281,314,000	68,386,000
Styrene Plant						
Los Angeles, Calif.	57,000 ST	Dow Chemical	Shell Chemical	11,932,000	15,131,000	4,199,000
Chemical Plant (DDM)						
Naugatuck, Conn.	2,400 LT	U. S. Rubber	U. S. Rubber	350,000	386,000	158,000

Notes: * Former Operator; in standby since September, 1953. [a] Substantially representative of original construction cost. [b] Substantially representative of original construction cost plus additions. [c] Represents a tandem operation with Los Angeles petroleum-butadiene plant. [d] Leased. N. S. Not Sold—goes into standby for three years.

Humble Oil bought the 49,000 short ton plant at Baytown. Phillips Chemical bought the 71,200 short ton plant it has been operating at Borger.

The Shell Chemical Corp. has signed for the purchase of the 61,000 short ton plant at Los Angeles, Calif., while the Standard Oil Co. of California has bought the unit at El Segundo, Calif. These plants represent a tandem operation whereby Standard Oil of California's production of crude butadiene is transferred to Shell Chemical for purification.

The 78,000 short ton plant at Houston, Texas, now operated by Sinclair Rubber, Inc., has been sold to the Food Machinery & Chemical Corp. and the Tennessee Gas Co. Petroleum Chemicals, Inc., has signed for the 60,000 short ton plant at Lake Charles, La. This company is equally owned by the Continental Oil Co. and the Cities Service Oil Corp., the present operator. The 197,000 short ton unit at Port Neches, Texas, was jointly purchased by Goodrich-Gulf Chemicals and by the Texas-U. S. Chemical Co. This latter company is jointly owned by U. S. Rubber and the Texas Co. Total signed contracts call for an annual capacity of 539,200 short tons of petroleum-butadiene.

Alcohol-Butadiene Plants

The 128,000 short ton alcohol-butadiene plant operated for the government by the Koppers Co. at Kobuta, Penna., has been sold to Koppers. The trade had not expected that this plant would be sold and the announcement that Koppers would buy the plant came as somewhat of a surprise. The plant has not been operating since July, 1953, and has been maintained by Koppers in standby condition for the government. Under Koppers control, the plant may not be used for the production of alcohol-butadiene, however.

The other alcohol-butadiene unit, an 87,000 short ton plant at Louisville, operated for the government by the Union Carbide & Carbon Chemicals Co., has been leased to Publicker Industries, Inc. A special provision of the disposal law permitted the lease of the government-owned alcohol-butadiene plants, but none of the others.

Of the remaining plants, the 57,000 short ton styrene plant at Los Angeles, Calif., operated for the government by the Dow Chemical Co., has been sold to the Shell Chemical Corp. A 2,400 long ton chemical

plant at Naugatuck, Conn., operated for the government by U. S. Rubber, has been sold to that company. This plant produces DDM.

In the disposal law which permitted the negotiations for plant sales, Congress laid down three major premises for the Commission to work with. The contracts must pass inspection on all three counts to escape a Congressional veto. These conditions, incorporating recommendations of President Eisenhower, are:

(1) The facilities should be sold for their "full, fair value." While this term has never been translated into dollars and cents, it is believed to mean more than the depreciated book value of the plants which stands today at about $150,000,000. While the contract prices arrived at by the Commission and the purchasers will not be announced until the Commision reports to Congress, the totals are unofficially estimated at between $270,000,000 and $300,000,000.

(2) "Disposal must be effected in such a way as to insure to the consuming public and to the small and large fabricators alike the benefits of fair competition." The Commission has achieved some success in this respect, having sold two GR-S plants to small business groups, one of which also bought a petroleum-butadiene plant.

The rubber industry's "Big Four," accounting for over 80% of the industry's annual rubber consumption, will control plants with a capacity of 444,600 long tons of GR-S, approximately 65% of the total capacity going into private hands. Non-rubber consuming companies are buying all of the Butyl capacity.

(3) National Security. The plants are being sold with a contract provision requiring their ready availability for synthetic rubber production over the next ten years. They cannot, during this period, be converted to other uses, and—if shut down—the owners must be able to bring them back into production in short order.

Current Synthetic Situation

While the sale of the government synthetic rubber facilities occupied most of the headlines, the problems of running the plants continue. On December 20, 1954, Laurence B. Robbins, Administrator of the Federal Facilities Corporation, announced that FFC will sell approximately 62,000 long tons of GR-S during March, 1955.

GR-S sales have continued to show a steady increase over the past several months. March sales are up rather sharply due apparently to increased total rubber consumption and also a higher percentage use of synthetic rubber because of its currently lower cost.

Inventory of GR-S, including oil, held by the FFC as of November 30, 1954, was approximately 64,000 long tons. The increased production scheduled in November is being further stepped up with the objective of maintaining an inventory in the vicinity of 60,000 long tons. This will provide sufficient stocks so that a smooth transition from government to private ownership anticipated next Spring may be accomplished with ample supplies available for all consumers.

The following table sets forth, in long tons, an estimate of FFC production and sales of GR-S for the three months' period ending March, 1955. These figures include the oil content of oil-extended rubbers, but exclude the carbon black used in carbon black masterbatches.

Month	Production	Sales
January	54,100	48,000
February	49,200	50,000
March	55,100	62,000

Natural Rubber Situation

Prime Minister Sir John Kotelawala of Ceylon, on a recent visit to the United States, conferred with President Eisenhower and suggested to him that Ceylon be included in any program of economic aid to Asia even though aid to that country was cut off in October, 1951, when Ceylon began shipping rubber to Red China.

At a prior talk before the Overseas Press Club in New York, Sir John defended his country's five year trade pact with Red China as having been forced by the price of natural rubber, which is Ceylon's second biggest export. The drop in natural rubber prices was caused by tariff protection of the U. S. synthetic rubber industry, he maintained.

A few days later, speaking before the National Press Club in Washington, Sir John hinted that Ceylon may break off its five-year rubber-rice pact with Red China if upcoming price negotiations fail to reach agreement.

The Ceylon-China arrangement provides for 50,000 tons of rubber a year at higher than world prices for approximately 270,000 tons of rice at slightly less than world market prices. Three years ago, rice was very scarce. Today, Ceylon is said to have an exportable surplus so that much of the rice she gets from China is exported to Japan.

On a visit to Akron, Sir John stated that only a "fair price" for natural rubber can save Asia from Communism. "If the price of synthetic rubber forces natural rubber to uneconomic rates of production, there is no alternative to Communism in Asia," Sir John declared.

Incidentally, on December 11, Ceylon's national press came out strongly against the invoking of the Battle Act against Ceylon on the ground of her rubber-rice pact with Communist China. The *Ceylon Daily News* said that in applying the Battle Act to Ceylon, the U. S. "betrayed a failure to appreciate the fact that Ceylon did not enter into the pact out of sympathy for Communism. She was concerned only to take the best price for her rubber, on which the prosperity of a large number of Ceylonese nationals depends," the newspaper added.

It observed that application of the Act against Ceylon was in striking contrast with the treatment afforded to Western countries that have been trading with the Soviet Union.

GENERAL CABLE CORP. ANNOUNCES ELECTION OF FOUR NEW VICE-PRESIDENTS

E. B. McGrew

M. H. McGrath

A. Wacker

H. G. Richardson

General Cable Corp., New York, N. Y., has announced the election of four additional vice-presidents. They are: Martin H. McGrath, vice-president and chief engineer, Elliott B. McGrew, vice-president and director of purchases; H. George Richardson, vice-president and general sales manager, and August Wacker, vice-president. The new vice-presidents took over their new duties on January 1. Each of the four new officers has had more than twenty-five years' continuous service with General Cable. Mr. McGrath, who had previously been chief engineer, has been engaged in engineering and technical development work for General Cable since 1924. Mr. McGrew formerly was director of purchases. He has been employed in the Purchasing Department of the corporation since 1922. Mr. Richardson started with the company in 1916 and has advanced through the Sales Department after having been district manager at Chicago and New York, and then director of sales. Mr. Wacker joined the Sales Department of the corporation in 1926. He previously held the position of assistant to the president.

Second French Rubber Mission

A second French rubber mission is now visiting the United States, having started its tour on January 10th. The first French Productivity Team visited this country in February, 1952, under the leadership of J. Barratte of the Syndicat National du Caoutchouc, Paris, France. The second mission, called the Rubber Technical Complementary Mission, will stay in the United States for six weeks visiting American rubber manufacturers under the auspices of the Foreign Operations Administration. Jean Dutlinger is head of the mission, and other members include: René Aubertin, Edmond Barrie, Antoine Gianni, Jean La-Barraque, Paul Lachaud, Michel Rideau, Paul Rothenburger, and François Roullet-Chery.

A.S.M.E. RUBBER AND PLASTICS DIVISION HOLDS MEETING IN NEW YORK

The Rubber and Plastics Division of the American Society of Mechanical Engineers met at the Hotel Statler in New York City on December 2 and 3 in conjunction with the 1954 Annual Meeting of the parent organization which was held on November 28 through December 3. The Rubber and Plastics Division meeting was unusually well-attended with approximately 120 members and guests present at some of the sessions.

Morning and afternoon sessions on Thursday, December 2, were devoted to rubber, while the sessions on the following day were devoted to plastics. The rubber sessions consisted of a symposium on "Vibration and Impact Isolators", with the theme of the morning session being "Shock Isolators". Alvin W. McKaig (Fabreeka Products) served as chairman of this session with J. F. Downie-Smith (Iowa State College) as vice-chairman.

The first paper presented at this session was entitled "The Effect of Pulse Shape on Simple Systems Under Impulsive Loading", by Charles E. Crede of the Barry Corp., Watertown, Mass. This paper proposed modified parameters for presenting "shock spectra" for elastic systems acted upon by acceleration impulses. It was shown that the ratio of maximum response acceleration to maximum acceleration of the pulse is a function of the pulse shape.

By introducing velocity change (impulse or change in momentum) in place of maximum acceleration of the pulse, the influence of pulse shape on the spectrum is materially reduced. The significance of the spectrum for lightly dampened systems was considered, where failure may result from fatigue after many cycles of stress reversal induced by a single pulse.

Shock Mount Evaluation

The next paper, by J. Paul Walsh and Ralph E. Blake of the Naval Research Laboratory, Washington, D. C., was entitled "Evaluation of Shock Mounts". The paper was read by Mr. Walsh. The authors described a method for determining the performance of shock mounts under the action of "standard" shock motions. The performance is evaluated by the magnitude of the shock spectrum of the motion of a rigid load on the mount.

A comparison was made of the performance of several different mounts as well as for rigid coupling. Additional information was presented illustrating the dynamic physical properties of mounts under the conditions of applied shock mounts, which may be used to assist in the evaluation.

The last paper at this session was entitled "Impact and Longitudinal Wave Transmission", by Edward A. L. Smith of the Raymond Concrete Pile Co., New York, N. Y. In this paper, the necessary formulas for a numerical method of calculation were derived without the use of calculus or other advanced mathematics. An illustrative problem was solved in complete detail and eight different types of impact discussed.

The author also described methods for taking account of friction, damping, coefficient or restitution, plastic flow and gravity. The speaker also outlined branched systems and then gave some methods for checking the calculated results.

The theme of the afternoon session on December 2 was "Vibration Isolators". Jacob P. de Hartog (M.I.T.) served as chairman of this session with Irwin Vigness (Naval Research Laboratories) as vice-chairman. The first paper at this session was prepared by Richard C. Dove and Glenn Murphy (Iowa State College), and covered the subject "Experimental Technique for Predicting the Dynamic Behavior of Rubber".

Mr. Dove, who read the paper, presented an experimental technique for evaluating those mechanical properties of materials which permit the prediction of the stress-strain diagram associated with a given strain-time diagram. Particular attention was given to the unrelaxed or dynamic modulus of elasticity and the relaxed modulus.

It was shown how the energy loss for a cycle of loading and unloading depends on the rates of straining and unstraining as well as on any elapsed time between the straining and unstraining. The equipment and equations necessary to evaluate the properties and to make the predictions were discussed. The authors also compared several stress-strain diagrams with diagrams constructed from direct observations.

A paper on "Vibration and Shock Control: A Design Tool" was given by George H. Billman of the Lord Manufacturing Co., Erie, Penna. This paper treated the subject of vibration and shock control as related to product design. It was shown how, through application of engineered suspension systems, material savings, improved performance and longer product life are realized. Attention was given to the variety of control systems and products, the design of which represents marked engineering achievements.

The last paper presented at the afternoon session on December 2 was prepared by Lillian Sutter, librarian of the Rubber Division of the American Chemical Society, and Leora E. Straka, research librarian of the Goodyear Tire & Rubber Co. This paper, entitled "Engineering Developments in Rubber: 1953-1954", was presented by B. S. Garvey, Jr. (Sharples Chemicals), and offered a survey of developments in rubber during the period from July, 1953, to August, 1954, which are of interest to the mechanical engineer.

Engineering Properties of Plastics

As stated previously, the sessions on December 3 were devoted to plastics and constituted a symposium on "Engineering Properties of Plastics Materials." C. Howard Adams (Monsanto Chemical) served as chairman of the morning session, and George H. Williams, Jr. (Bell Telephone Laboratories) as vice-chairman. Papers presented at the morning session included:

"Precision Control of Injection Molding Pressure", by Gordon B. Thayer, Dow Chemical Co., Midland, Mich.

"Considerations in the Design of Plastic Structures for Light Weight", by C. Howard Adams, Monsanto Chemical Co., Springfield, Mass., William N. Findley, Brown University, Providence, R. I., and Fred D. Stockton, Monsanto Chemical Co., Springfield, Mass.

"Uses of the Repeated Hysteresis Loop for the Evaluation of Reinforced Plastic Materials and Structures", by George W. Bainton, Jr., General Electric Co., Schenectady, N. Y.

"Molding Reinforced Plastics with Low Cost Cores", by W. B. Wilkins, consulting engineer of Ridgewood, N. J.

A. C. Webber (DuPont) served as chairman of the afternoon session on December 3, and C. R. Stock (American Cyanamid) as vice-chairman. Papers presented at this session included:

"Recognizing Applications for Reinforced Plastic", by Robert W. Matlock, Zenith Aircraft, Gardena, Calif.

"Plastic-Covered Antennas Reduce Radio Interference", by Walter A. Von Wald, Jr., Naval Research Laboratory, Washington, D. C.

"Review of Plastics Developments in 1953-1954", by Frederick J. McGarry, Massachusetts Institute of Technology, Cambridge, Mass.

Division Appointments Announced

A luncheon meeting of the general, advisory and executive committees of the Rubber and Plastics Division was held on Friday, December 3, with Allen Gifford (Lord Manufacturing), the retiring chairman, presiding. Mr. Gifford announced that Gordon Thayer (Dow Chemical) would be the new chairman for 1955 and that Robert D. Stiehler (National Bureau of Standards) had been elected to the Executive Committee. R. G. Seaman *(Rubber World)* is the 1955 secretary. Other members of the Executive Committee include Fred Wehmer (Minnesota Mining) and R. W. Barber (St. Regis Paper).

It was also announced that Don Cornell (Goodrich Research) would continue to represent the Division on the Professional Divisions Committee of the parent society, and that M. E. Lerner (RUBBER AGE) would function as publicity director. Plans for the two meetings the Division intends to hold next year were discussed, including a Symposium on Adhesives which will be one of the features of the meeting to be held in June. J. M. Clark, manager of the Professional Divisions Committee, was present at the luncheon, and briefly outlined the functions of that group.

Bertine Heads BDSA Division

Herbert W. Bertine of the Allied Chemical and Dye Corp., has been named the new director of the Chemical and Rubber Division of the Business and Defense Services Administration, Washington, D. C. Mr. Bertine was to have taken office early in January.

Heads N. J. Zinc Purchasing

New Jersey Zinc Co., New York, N. Y., has announced the appointment of W. C. Dunlap as manager of purchasing to succeed W. J. Lee who retired on December 31, 1954. A. E. Turner has been named assistant manager of purchasing.

QUARTERMASTER CORPS OPENS NEW RESEARCH ESTABLISHMENT

The well-being of the foot soldier received a new boost on October 14 when Secretary of the Army Robert T. Stevens, and other high government officials dedicated the new QMC Research and Development Center at Natick, Mass. Located on Lake Cochituate, 15 miles west of Boston, the $11,000,000 center consolidates QMC research activities from Philadelphia; Washington; Lawrence, Mass.; and Jeffersonville, Ind. Also a part of the QMC research and development organization but continuing as separate installations are the Food and Container Institute for the Armed Forces in Chicago, and the Field Evaluation Agency at Fort Lee, Va.

The new Center is also headquarters of the recently established Quartermaster Research and Development Command, headed by Brigadier General Charles G. Calloway. The Command directs all the QMC research and development activities including those at the Center and at Chicago and Fort Lee. There are also a number of temporary test sites throughout the United States and overseas where tests are directed by the Command.

A. Stuart Hunter is the Scientific Director of the Center and under his direction are some 1000 scientists, engineers and other professional and supporting personnel. Their job is to improve the lot of the soldier—to protect him with adequate clothing for all climatic conditions and to supply his needs for food and portable shelter to a maximum extent consistent with the ingenuity of the scientists and engineers to design and contrive, and the industrial potential of the nation to supply.

Research Building Data

The Research Building, the largest of the ten buildings at the Center, is 500 ft. long, 60 ft. wide, and has three stories and basement. In it are the research elements of four divisions: Environmental Protection; Textile, Clothing and Footwear; Pioneering Research; and Dispensing and Handling Equipment. The Development and the Enginering Buildings are occupied by personnel of the Mechanical Engineering; the Textile, Clothing and Footwear; and the Chemicals and Plastics Divisions.

Considerable space has been set aside in the Engineering Building for pilot-plant investigations on plastics and rubber by the Chemicals and Plastics Division. Compounding and sample fabrication facilities include a rubber mill, a four-roll inverted calender, a coating machine and, several hydraulic presses.

Several years ago the Quartermaster Corps was directed to assume the responsibility for research in low-temperature rubber for the Department of the Army. As a result of this assignment, the QMC has developed, in cooperation with several outside laboratories, an elastomer having superior properties at low temperatures as compared with GR-S synthetic rubber or natural rubber.

The favorable strength-weight ratio of reinforced-plastic materials is being exploited by the use of these materials in such items as arctic sled boats, pack boards, bread boxes, foot lockers, etc. Other current uses for plastics include tableware and buttons.

Unsupported film and coated fabrics are being investigated fully by the QMC for a number of possible applications. Film has possibilities for protective clothing and as protective covering for equipment in addition to its obvious use in food packaging. Coated fabrics are used for rainwear and to a limited extent in tentage.

The QMC has for some years maintained extensive testing facilities for plastics and especially for films and coated fabrics. Quartermaster personnel have been active on ASTM committees in helping to work out test methods for these materials and the Society is indebted to them for this assistance and cooperation. Test facilities for plastics and rubber include various conditioned rooms and machines for determining physical properties of plastics and rubber. Accelerated weathering equipment is also available.

Other products under the Chemicals and Plastics Division are detergents, fungicides, rodenticides, germicides, pretreatments, protective finishes, paper and paper products, adhesives, and laminated plastics such as those designed to afford bullet protection as in the Quartermaster body armor.

Quaker Rubber Corp., Philadelphia, Penna., has issued a new, 58-page general catalog on its industrial rubber products. Address requests to the company at Tacony and Comly Streets, Philadelphia 24.

LANDERS CORPORATION ANNOUNCES APPOINTMENTS TO RESEARCH STAFF

Charles J. Chaban

William A. Corry

Landers Corp., Toledo, Ohio, has announced the appointment of Charles J. Chaban as research director and William A. Corry as laboratory manager. In other new assignments, Dale Marsh has been named to work as senior research chemist with Mr. Chaban. Edith B. Pursel has been placed in charge of the analytical laboratory, spectophotometry and products specifications, and Kathleen M. Merritt will supervise the testing laboratory section. Previous to the new appointments, Mr. Chaban had been chief chemist and laboratory manager, and Mr. Corry had been assistant to Mr. Chaban. In his new capacity, Mr. Chaban will concentrate on research projects leading to the improvement of present products and the development of new products in the rapidly expanding field of coated and processed fabrics. A graduate of the Polytechnic Institute of Liege as an industrial chemist and of the Textile Institute of Verviers (Belgium) as a textile engineer, Mr. Chaban had a distinguished career in Europe before coming to the United States. Before joining Landers in 1943, he was employed as a research chemist with the Plastics Division of the U. S. Stoneware Co. of Akron, Ohio, the first American company he joined after arriving from Europe in 1942. He holds six U. S. and four foreign patents on the stabilization of polyvinyl chloride. During World War II, he served as a consultant to the Quartermaster Corps of the U. S. Army.

As laboratory manager, Mr. Corry will have general supervision of the new Landers laboratory, providing services and technical information to the Production Control and Sales Departments. A graduate of the Georgia Institute of Technology, Mr. Corry was civilian chief of the Textile Branch of the Air Research and Development Command, Wright-Patterson Air Force Base, Dayton, Ohio, before joining Landers. He has been with the Army Quartermaster Corps, the Department of Agriculture and the General Tire & Rubber Co. as head of quality control in that firm's Barnesville, Ga., plant.

THIRD ANNUAL SYMPOSIUM ON WIRES AND CABLES HELD BY SIGNAL CORPS

Approximately 560 delegates, representing over 100 companies, attended the Third Annual Symposium on "Technical Progress in Communication Wires and Cables" held at the Berkeley-Carteret Hotel in Asbury Park, N. J., December 7-9. The symposium was sponsored by the Wire Communication Branch, Coles Signal Laboratory, Signal Corps Engineering Laboratories, Fort Monmouth, N. J., with the cooperation of the wire and cable industry. Registration for the symposium set a new high.

Various members of the Fort Monmouth group presided over the several technical sessions, including M. Tenzer, Chief of the Microwave Unit; W. R. Krueger, Chief of the Line Equipment Unit; H. F. X. Kingsley, Chief of the Wire and Cable Unit; H. G. Gold, Chief of the Cord and Cordage Unit, and H. L. Kitts, Chief of the Outside Plant Equipment Section. The welcoming address was made by Brigadier General F. F. Uhrhane, Commanding General of the Signal Corps Engineering Laboratories.

In addition to the technical program, the meeting featured a cooperative cocktail party on Tuesday evening, December 7, and a banquet on Wednesday evening, December 8. Guest speaker at the banquet was Colonel Alton McLane who spoke on "Communications in Berlin" and who discussed some of the difficulties the Allied Command has encountered in that area. Colonel E. L. Love, of the Whitney Blake Co., acted as toastmaster, and performed his usual commendable job. Some 350 delegates attended the banquet which included the presentation of an excellent variety show.

Application of Silicone Rubber

Among the many interesting papers at the symposium was one on "The Application of Silicone Rubber Insulated Wires and Cables" by L. B. Short of the General Electric Co., Bridgeport, Conn. In his paper, Mr. Short described the properties of silicone rubber which make it particularly suitable as an insulation for wires and cables.

He also offered a discussion on applications, including electronic hook-up wire, aircraft wire, ignition wire, apparatus lead wire, fixture and appliance wire, refrigerator defroster wire, heating cable, control cable and power cable.

Messrs. Kitts and Kingsley presented a paper on "The Role of Wire and Cable in Military Communications". The authors stated that providing adequate communications requires the design, manufacture and coordination of hundreds of pieces of different equipment, and the training and coordination of personnel.

Emphasizing that wire and cable are the backbone of the communication system and that vast quantities are required in wartime, the authors reviewed some of the many different types of wire and cable used in modern combat and discussed some of the problems inherent in their manufacture and use.

"The Aging of Polyethylene Compositions" by N. D. MacLeod, Imperial Chemical Industries, Ltd., Welwyn Garden City, England, described the work on the atmospheric aging of polyethylene compositions at elevated temperatures in the solid state. It included results of weathering trials of polyethylene compositions exposed in India for the past five years.

In discussing matters having to do with the aging of polyethylene compositions and the results of work to study these factors, the author considered such subjects as thermal oxidation, oxidation of irradiated polyethylene, weathering of compositions, etc.

Conductor Temperature

"The Effects of Conductor Temperature on the Quality of Extruded Vinyl Wire Insulation" was the title of a paper presented by E. E. Griesser and M. M. Suba of the Bakelite Co., Bound Brook, N. J. It was stated that the properties of vinyl wire insulations which largely determine their quality are those which, for the most part, are not readily apparent. Some insulations which have an excellent outward appearance may fall far short of meeting the complex requirements usually included in present-day insulated wire specifications, the authors observed.

Appreciating the importance of controlling the conductor temperature during extrusion of vinyl insulations, the authors undertook this study. The authors hoped that definite answers might be obtained to the question of the interrelation of conductor temperature, compound temperature, wall thickness, and the several properties which enhance the quality of vinyl wire insulations.

W. C. Smith of the Standard Oil Development Co., Elizabeth, N. J., gave a paper on "Butyl Insulation". Mr. Smith stated that Butyl rubber has been of considerable interest to the wire and cable industry ever since the early 1940's. This is because it is inherently resistant to ozone, heat aging, has excellent electrical properties, and is vulcanizable. The recently announced advances in heat, moisture, and ozone resistance, coupled with the good availability outlook, have greatly stimulated the demand for Butyl rubber, Mr. Smith declared.

Information in the paper was grouped under properties desired in insulation, such as processing to give smooth non-swollen extrusions, ozone resistance and ways to obtain optimum resistance to cracking, heat aging, electrical properties and their stability in water, dielectric strength, a comparison of sulfur with quinoid cures, and jacketing.

Butyl Polymer Compounding

"Butyl Polymer Compounding for Insulations" was the title of a paper by Emil W. Schwartz of Southern Clays, Inc., New York, N. Y. The purpose of this paper was to outline, in a very practical way, three major factors: (1) Standard "base" formulations; (2) Methods of mixing and accelerating these formulations, and (3) Results obtained by following the outlined procedures.

The paper dealt with the two premises which seem standard in insulation procedure—the exclusive use of R-35 polymer and the quinone derivatives with red lead as the curing system. The author also classified the uses of Butyl insulation into two broad branches for purposes of the paper—low and high voltage use.

Cold GR-S for Wire Insulation

L. H. Howland, R. W. Brown, and C. W. Lawson, of the Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn., submitted a paper on "Cold GR-S Polymers for Wire Insulation." The authors noted that the well-defined improvement in tire tread wear of GR-S polymers prepared at low temperatures has stimulated interest in these materials for use in other applications, including wire insulation.

During the past several years, a number of experimental polymers designed specifically for use on wire have been prepared at low temperatures by synthetic rubber development groups and tested by wire manufacturing companies and the Signal Corps. The improvements of cold over hot GR-S, while perhaps not as great as in tire tread stocks, are sufficient to have caused a change of about 50% of the wire insulation polymer production from the hot to the cold types, the authors stated.

The unusual properties of a new elastomer were covered in a paper on "Kel-F Elastomer—A New Material for the Electrical Industry." Prepared by M. E. Conroy and L. E. Robb of the M. W. Kellogg Co., Jersey City, N. J., the paper emphasized the high tensile strength of Kel-F Elastomer as well as its extensibility, tear strength, abrasion resistance, thermal stability, extremely low water absorption and resistance to oxidants.

The authors expressed the hope that these characteristics would assist the electrical industry in the design of specialized insulation to be used in applications where a high strength rubber must withstand heat and corrosive chemicals. Among such applications named were insulated wire and cable, sheath stock, tapes, potting compounds, and electrical connectors, grommets and seals.

Irradiated Polyethylene

P. A. Goodwin of the General Electric Co., Pittsfield, Mass., presented a paper on "Irrathene 201 Irradiated Polyethylene—A New Cable Insulation." The speaker declared that Irrathene 201 offers all of the advantages of conventional polyethylene. In addition, it may be used at higher temperatures than conventional polyethylene and is highly resistant to environmental stress cracking.

Mr. Goodwin said that the new material offers the possibility of encapsulation of conductors or various electrical devices to provide a homogeneous water-tight case of excellent properties. It should be considered for use wherever layer insulation such as varnished cloth, oil-impregnated paper or plastic films are now used or in new applications whenever the encapsulation technique is of interest. He also stated that developmental quantities are now being

offered for sale and a continually increasing level of production is expected through the coming year.

"Engineering Polyethylene for Wire and Cable" was the title of a paper presented by E. J. Burroughs and E. E. Lewis of the Polychemicals Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. According to the authors, polyethylene is established now as a remarkably versatile plastic for wire and cable insulations and jackets. Great strides are being made in engineering this material for the specific needs of industry. Performance has been improved both by basic changes in the molecular structure and advances in compounding with improved stabilizers and other ingredients.

Much has been learned in recent years about controlling, through the synthesis conditions, the form of the polyethylene molecule and the gross properties of the product. It was shown how the polyethylene molecule has been redesigned and rebuilt to improve the utility of the material and extend its range as a wire covering. In addition, special compounds have been developed which extend the range even further, and continued progress can be expected.

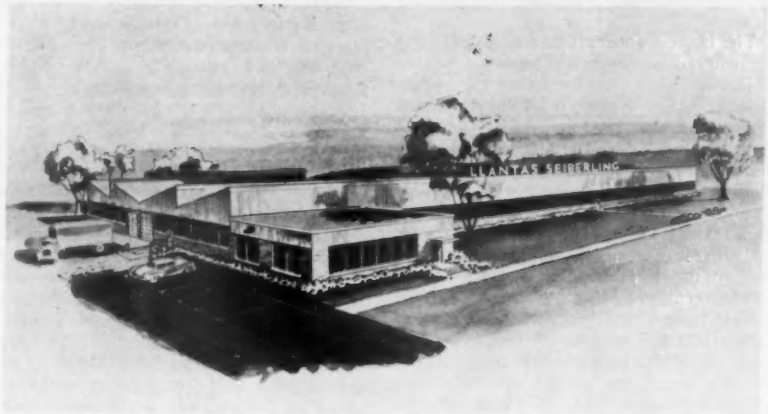
"The Natural and Artificial Aging of Wire Jackets" by Charles W. Hamilton, Robert I. Leininger, and G.M.L. Sommerman of the Battelle Memorial Institute, Columbus, Ohio, was another of the papers presented at the symposium. The study described in this paper was conducted at the Institute under the sponsorship of the Coles Signal Laboratory.

The purpose of this project was to correlate the natural outdoor-aging processes of plastic materials, particularly nylon, with those occurring under accelerated conditions in the laboratory. It was desired to establish an accelerated aging procedure that would, in a short span of time, produce the same effect as prolonged outdoor exposure, thus providing a convenient means of screening new modifications of these plastics as well as controlling their quality during production.

New British Rubber Directory

Full details of manufacturers, their products and their advertisements are given in the "Directory of British Rubber Manufacturers and Products" published by the Federation of British Rubber Manufacturers' Associations, 43 Bedford Square, London, W. C. 1. It will be distributed to every country in the world including the Soviet Union and China, and is one of the most comprehensive directories of its kind ever compiled, the publishers state. Nearly 550 separate products are listed under headings which cover industrial, hardware, domestic, sports and surgical goods, adhesives, fabrics, floor coverings, latex foam and footwear. In addition, there are sections devoted to tires and tire sundries and accessories. This is a complete buyer's guide to the rubber industry, in English, French and Spanish. The overseas interest in the directory has been considerable, and of the initial printing order of 4,000 about 3,500 will be sent abroad. The directory is free to overseas importers of rubber products, and to other readers at approximately $3.50.

SEIBERLING TIRES SOON TO BE PRODUCED IN NEW COLOMBIAN PLANT



Overseas production of Seiberling tires will begin in early 1955 in this modern plant in Colombia, South America. The new tire plant is being constructed by a South American corporation, Productos de Caucho Villegas, S.A., which was formed earlier this year by the Seiberling Rubber Co. of Akron, Ohio, and a group of Colombian investors. A predecessor firm, Almacen Villegas—Colombia's largest producer of rubber flooring and a major manufacturer of footwear and tire recapping material—has been incorporated into the new company.

Riverlake Material Requirements

According to officials of Riverlake Belt Conveyor Lines, Inc., Akron, Ohio, 1,000,000 tons of raw and fabricated materials will be required for the construction of Ohio's 105-mile, two-way conveyor belt transportation system between terminals on Lake Erie and the Ohio River. It is estimated that 440 miles of rubber belting weighing 34,757 short tons will be required. The belting will be made of 21,156 tons of rubber and 13,601 tons of fabric. This is said to be enough rubber to make nearly 4,000,000 automobile tires and the rayon fabric would not all be used up in the manufacture of 9,000,000 tires. Steel to be used will total 267,262 tons and 742,241 tons of cement, sand and stone will go into the concrete foundations. The conveyor line will require 2,300 miles of wiring, while field coating of the conveyor structure will consume 52,415 gallons of paint.

Ohio Rubber Promotes Two

Ohio Rubber Co., Willoughby, Ohio, has announced the promotion of Alex Bourquard to treasurer of the company and Scott A. Edgell to controller. Both promotions were to fill vacancies caused by the retirement of Howard J. Bechtold as treasurer and controller on January 1, 1955. Mr. Bechtold had been with the company since April 15, 1927. Mr. Bourquard had been assistant treasurer of the company since February, 1944. He started with the company in the General Accounting Department in December, 1932. Mr. Edgell had served as assistant controller since February, 1944. He started with the company in February, 1935.

Another copy of RUBBER AGE needed in your office? Use the coupon on page 641.

Receives Safety Awards

On December 8, 1954, the Kentucky Synthetic Rubber Corp. of Louisville, Kentucky, was presented the Award of Honor from the National Safety Council and the Distinguished Service to Safety Award from the Louisville Safety Council for the completion of 3,000,000 accident-free man hours over a 44 months' operating period. In addition to these awards each employee of the company was presented with a leather encased travel clock. A special program for presentation of these awards was held at the plant. In attendance were representatives of the Federal Facilities Corporation, Washington, D. C., civic leaders, and union representatives, who congratulated the employees on this outstanding safety record.

Of the 23 plants comprising the Government's synthetic rubber program throughout the United States and operating under the Federal Facilities Corporation, Kentucky Synthetic has for the past 17 months led the entire industry for the number of consecutive injury-free man hours worked. In receiving these awards for the company, H. W. Cable, plant manager, stated, "The record itself is no accident; it was achieved only through the complete cooperation of each and every one of the 350 employees."

Joins Organic Research Staff

Dr. Victor J. Anhorn has been added to the organic research staff of the Goodyear Tire & Rubber Co., at Akron, Ohio. Dr. Anhorn received his bachelor of arts degree in chemistry from Huron College. He holds a master of science and a doctorate degree in physical and organic chemistry from Purdue University. He also is a member of the American Chemical Society. During World War II, Dr. Anhorn was engaged in petroleum research work in Harmarville, Penna.

DUPONT ANTITRUST LITIGATION DISMISSED BY FEDERAL COURT

The biggest antitrust suit in history was thrown out of Federal District Court in Chicago, Ill., on December 3, when Federal Judge Walter J. LaBuy dismissed the government's civil antitrust suit against the DuPont interests, General Motors Corp. and the U. S. Rubber Co. The DuPont organizations involved were E. I. du Pont de Nemours & Co., Inc., Christiana Securities Co., and the Delaware Realty and Investment Co., and individual members of the du Pont family.

The crux of the government's case, Judge LaBuy said, was the charge that General Motors was forced to buy DuPont or U. S. Rubber products exclusively. "In various ways", he pointed out, "the government alleged that General Motors either agreed to such limitation or was forced to it by DuPont. But the evidence fails to support the government charges."

Turning to the government's charge that DuPont had gained control of U. S. Rubber for the purpose of creating a protected market, Judge LaBuy stated: "There is no evidence that the syndicate, or Rubber Securities Co., or the du Pont family in aggregate ever had voting control of U. S. Rubber. The government, moreover, has failed to show that the U. S. Rubber stock held by the defendant individuals and the members of the du Pont family was acquired with the intent to create a protected market for DuPont or for U. S. Rubber, or was ever used for that purpose."

He also ruled that there was no evidence to support the government's charge that DuPont had forced General Motors to buy certain of its products. "There is no evidence that General Motors was constrained to favor, or buy, a product solely because it was offered by DuPont," the Judge declared.

"There is no limitation or restraint upon the freedom of General Motors to deal with its chemical discoveries, no restraint or monopolization of the General Motors market, and no restraint or monopolization of the trade and commerce between DuPont and U. S. Rubber", Judge LaBuy declared.

Commenting upon the decision, Crawford H. Greenwalt, president of E. I. du Pont de Nemours & Co., Inc., said: "We are naturally gratified at the decision in this case, which has been under litigation for approximately five years. We were confident that this would be the result and are grateful to our many friends who expressed similar confidence during the course of the long proceedings".

A decision on whether or not to appeal the decision is up to Attorney General Brownell and Stanley N. Barnes, head of the Antitrust Division of the Department of Justice. Sources close to the long-drawn out litigation expressed doubt that an appeal would be sought.

Anaconda Wire & Cable Co., New York, N. Y., has developed a corrosion-resistant, Type CP direct burial cable which has been found effective in oil refinery, pipe line, chemical plant, utility and other installations.

Chicago-Allis Mfg. Corp. Formed

Edward H. Ball, president of the Chicago Belting Co., Chicago, Ill., has announced a consolidation of the company with its two subsidiaries, Allis Rubber Corp. and the Allis Seal Corp., both of Chicago. The new corporation will be known as the Chicago-Allis Manufacturing Corp., with headquarters at 103 North Green Street, Chicago 7, Ill. The purpose of the consolidation is to effect greater over-all efficiency in the manufacture and sale of all products, and to render even better service to all customers. The ownership and executive management remains the same as in the past, with key personnel of the two former subsidiaries joining with the management of Chicago Belting and sharing with them in the responsibilities of the operating and manufacturing management of the new corporation. The three corporations consolidated into the new Chicago-Allis Manufacturing Corp. will become divisions of the new corporation, that is, Chicago Belting Division, Allis Rubber Division, and the Allis Seal Division.

Carey to Head Goodyear-India

Appointment of R. E. O. Carey as managing director of Goodyear-India has been announced by F. T. Magennis, vice-president and general manager of the Goodyear Tire & Rubber Export Co. Associated with Goodyear's business activities outside the United States since 1930, Mr. Carey joined the company in India at that time and was named office manager in Bombay. He later became sales representative and district manager in Bombay. In 1952, he established a Goodyear subsidiary in Pakistan and became its managing director. Early in 1954, Mr. Carey joined the staff of the Australasian and Eastern Division of the company in Akron.

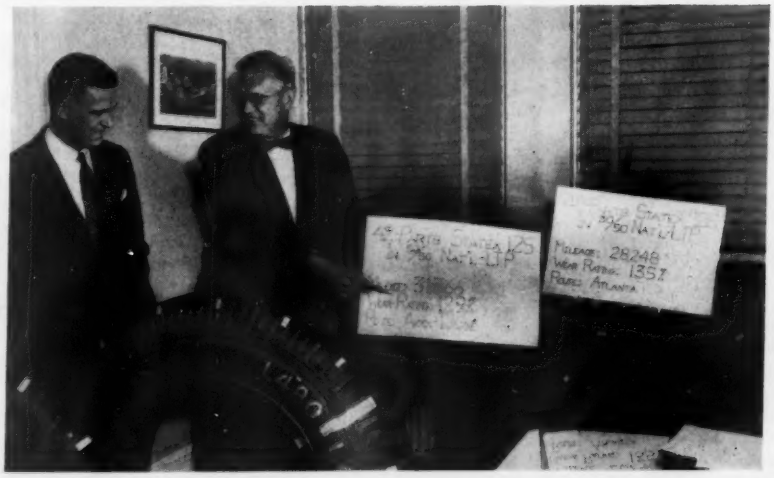
Neoprene Prices Reduced

A 5% reduction in the price of two types of neoprene has been announced by the Rubber Chemicals Division of E. I. du Pont de Nemours & Co., Inc. Effective January 3, 1955, neoprene Types W and WHV are reduced from 41 cents per pound to 39 cents per pound. The price cut was made possible, the company said, by manufacturing economies resulting from process improvements and the two-and-one-half-fold increase in production of these types which has occurred in the past twelve months. Type W was first made in 1949 and Type WHV in 1953. The increase in production of these types is due to the fact that for most purposes they are more economical to use than other types. Also, the company states, Type W produces finished products of generally higher quality than the older types. It should be noted that the price cuts were made on two of the lower cost neoprenes and on the two types which represent a third of the sales in total dry neoprene types. The new plant which the company is building at Montague, Mich., will provide additional capacity for these two types of neoprene.

Cobb Appointed Sales Manager

The appointment of William H. Cobb, Jr., as sales manager of "Cordura" high tenacity rayon was recently announced by the Textile Fibers Department of E. I. du Pont de Nemours & Co., Inc. Mr. Cobb, formerly a salesman in the rubber industry sales section, replaces Howard P. Brokaw whose promotion to assistant manager of the department's industrial sales was recently announced. The new manager has been with DuPont since 1947 and has been connected in various capacities with the sale of rayon since 1949.

BINNEY & SMITH DISPLAYS ROAD TEST TRUCK TIRES AT AKRON OFFICE



As shown above, Binney & Smith, Inc., has had on display at its office in Akron, Ohio, a series of truck tires from a road test program. The advantages of "Statex 125" in a 50-50 blend of natural rubber and cold rubber are clearly demonstrated by reduced rate of wear and elimination of cracking, the company states. Here, J. W. Snyder, technical director, is pointing out to J. M. Hamilton, vice-president in charge of sales, the visual evidence of these wear and cracking improvements.

RMA PREDICTS INCREASES IN 1955 PRODUCTION AND USAGE

Both rubber consumption and production of rubber end products will rise in 1955 toward but not quite to the all-time records marked up in 1953. Noting that 1954 was a "good year" by all past standards, the Rubber Manufacturers Association based this outlook for the year ahead on an estimate by its Statistical Committee. This is the way the Association sees it:

Rubber consumption in 1955 will reach or exceed the average yearly consumption in the United States since 1950. The average rubber consumption figure for those years is 1,255,000 long tons. This compares with 1954 anticipated consumption of 1,205,000 long tons. In terms of tires, this rubber consumption is translated into unit production as seen in Table I.

Both pneumatic tire unit production at projected levels and estimated rubber consumption point to modest gains over 1954. In neither instance, however, are the figures expected to reach the all-time peaks scored in 1953. The comparison with respect to rubber consumption is shown in Table II.

The 4.1% increase in total rubber consumption now estimated for 1955 covers the entire rubber manufacturing industry. As indicated in the table showing projected tire unit production, the gain will be slightly less than this in the field of transportation products.

Production of non-transportation products (numbered in tens of thousands of different end items) is expected by the industry to be substantially higher than last year.

Demand in 1955 for heavy industrial rubber goods is expected to follow the moderate rise predicted by economists for industrial activity generally in the year ahead, according to the association. The same pattern is expected to hold for production of light mechanical rubber goods, such as molded and extruded items, used principally as assembly components by the automotive and electrical household goods industries.

Latex Foam Products

Latex foam products which have experienced a dramatic postwar growth in this country are again expected to prove an important pace setter in the rubber products field. Rapidly expanding applications in the automotive and home furnishing fields will continue their better-than-average rate of growth. Latex, both natural and synthetic, now accounts for over nine per cent of the total new rubber used in the United States. Impressive improvements in synthetic rubber latices—particularly in modified types of cold GR-S latex—have enabled these American-made liquid rubbers to capture an increasingly large proportion of the latex market. Expectations are that their use will be materially expanded in 1955.

Manufacturers of rubber flooring materials expect to increase their volume in 1955, particularly in the "do-it-yourself" field. Forecasts as to residential and commercial construction support this optimism.

In other lines more closely linked to personal use, such as rubber sundries, rubber-soled canvas footwear, heels and soles, and rubber coated fabrics, increased production is expected to follow the nation's constantly rising population curve.

U.S. Rubber Consumption

U. S. rubber consumption is currently running at the rate of 19 pounds per capita. Elsewhere, on the European continent, for example, per capita consumption ranges from 2½ pounds in Italy to 8 pounds in England. In the past few years per capita use has tended to rise more rapidly outside the U. S. For this reason, industry analysts expect to see rubber consumption in the rest of the world rise by a slightly greater rate in 1955 than it will in this country. Predictions are that rubber consumption outside the U. S. may reach 1,235,000 long tons in 1955 as compared with 1,185,000 in 1953. The estimate, thus, is that over-all world rubber-consumption could reach 2,490,000 long tons, slightly higher than peak consumption in 1953.

In its year end review, the RMA took note of a precedent-setting meeting between natural rubber producing, shipping and packing interests in Southeast Asia with principal rubber consuming interests in the United States and Europe. Initiated by the association's Crude Rubber Committee and its counterpart committee of the Rubber Trade Association of New York, the meeting was held in Singapore to explore ways of improving natural rubber quality and packing. A second International Rubber Quality and Packing Conference has been scheduled tentatively for May 3-6, 1955, in New York.

As a result of the first conference, the principal world rubber associations reached agreement to recognize the 30 official RMA type samples of natural rubber (covering all grades) and the seven so-called Singapore types as 37 universal types on which international trade in rubber could be conducted. The conference also approved the RMA Packing Specifications with certain clarifying amendments.

For the first nine months of 1954, factory employment in the rubber manufacturing industry averaged 194,600 clockcard workers as compared with 222,000 in the same period in 1953. Employment was materially affected in July and August, 1954, by two major strikes in the industry. In the same nine months' period, average hourly earnings in the tire and tube industry rose to $2.25 per hour. This average hourly earnings figure does not reflect substantial additional employee benefits through company-paid insurance and pension plans.

TABLE II — CONSUMPTION OF NEW RUBBER BY TYPE IN LONG TONS

	1953	*1954*	*1955*
Natural Rubber	553,000	583,000	565,000
Synthetic Rubber	785,000	622,000	690,000
Total	1,338,000	1,205,000	1,255,000
% of Synthetic	59	52	55
Reclaimed Rubber	285,050	241,000	251,000

TABLE I — COMPARISON OF U. S. PNEUMATIC TIRE PRODUCTION

	1953	*1954*	*1955*
Passenger & Motorcycle	81,431,000	76,000,000	79,000,000
Truck-Bus	14,690,000	12,300,000	13,000,000
Tractor	3,756,000	3,065,000	3,510,000
Airplane	474,000	400,000	490,000
Total	100,351,000	91,755,000	96,000,000

Three New Tubeless Tire Valves

A. Schrader's Son, Brooklyn, N. Y., is manufacturing three new tubeless tire valves for the replacement of damaged original equipment valves. The new Schrader No. 4337K3 Standard Clamp-In Type Replacement Valve fits all wheels equipped with tubeless tires. It provides a practical method by which any tire service repair man can replace tubeless tire valves. Special large rubber washers are packed with each valve to permit attachment to rims with round or oval shaped rim holes. An airtight seal is formed between the valve and the rim by tightening the hex nut until the upper round rubber washer is squeezed flush with the large metal washer beneath the hex nut. The second type valve produced by the company is the new Schrader No. 54 Rubber Covered Snap-In Type Replacement Valve, designed to form an airtight seal in ⅝-inch round rim holes in passenger car wheels. These Snap-In type valves are easily installed when lubricated with water and pulled into position with a regular Schrader No. 8104 Valve Fishing Tool. The third type valve is the No. 3460 Replacement Tubeless Tire Valve, similar to the all-purpose No. 4337K3, but it has only one rubber washer. This valve is used on some 1955 cars as original equipment.

Randex Foam Rubber Formed

Rex Commercial Corp., New York, N. Y., purchaser of the machinery and equipment of the Randolph Foam Rubber Corp. of Brooklyn, N. Y., at a public auction on December 16, 1954, has announced the formation of the Randex Foam Rubber Corp. at 573 Metropolitan Avenue, Brooklyn, N. Y. Randex Foam Rubber will engage in the manufacture of a line of foam rubber specialties.

NATURAL RUBBER DUPLICATED BY GOODRICH-GULF SCIENTISTS

American scientists have finally succeeded in reproducing the true molecule of crude, or tree-grown rubber, a major scientific achievement, according to an announcement by William S. Richardson, president of Goodrich-Gulf Chemicals, Inc., which is owned half by the Gulf Oil Corp., and half by the B. F. Goodrich Co.

According to Mr. Richardson, who is also president of Goodrich, the successful reproduction of crude rubber synthetically has been a goal of world scientists for generations. It has also posed a problem in the self-sufficiency of the United States, he said, because although it is the world's largest consumer of natural rubber, it has had to import every pound used from the Far East, South America, or Africa.

The actual discovery was made in the B. F. Goodrich Research Center at Brecksville, Ohio, by a research team assigned to the project by Goodrich-Gulf Chemicals, Inc. Joint teams of scientists in both Gulf and Goodrich laboratories have long been at work using a new approach to the challenging assignment.

The new man-made rubber has not yet been named, Mr. Richardson said, but patent applications have been filed with the U. S. Patent Office. The new rubber is made from different materials than those used in GR-S synthetic rubber and he said that the rubber could not be produced in presently existing government-owned synthetic rubber plants.

Cost Substantially Higher

Based on the best estimates that can be made at this early state of development of the discovery, the cost of the new material in commercially important volume would be substantially higher than the present price for GR-S which is 23c a pound, Mr. Richardson stated.

"It should be understood," Mr. Richardson said, "that GR-S is a very valuable material and is better for many uses than crude, or tree rubber. However, there is an area of usage where crude rubber is the preferred material, apart from the economics of the two materials. This usage embraces truck and airplane tires and today accounts for about 30 per cent of the total annual tonnage of the new rubber consumed in the United States.

"GR-S rubber in tires under heavy loads generates more heat than crude rubber, freezes at higher temperatures and in its uncured state is not as tacky, or sticky, as crude rubber. In all tests made to date, the newly-discovered man-made rubber possesses the physical properties of crude rubber even to tack and stickiness," Mr. Richardson declared.

The Goodrich-Gulf official said: "The new rubber will not affect disposal of government-owned synthetic rubber plants to competitive enterprise because of the economics involved, and the potentially higher cost of the new material. An added reason is the fact that GR-S man-made rubber has its own wide area of usage where it is the best material, notably for treads in passenger car tires.

"Our confidence that this new discovery will not be an unsettling factor is indicated by the fact that Goodrich-Gulf Chemicals, Inc., has filed bids to purchase certain government-owned facilities used to make GR-S. We are hopeful that these bids, representing what we believe to be full, fair value for the plants involved, will be accepted," Mr. Richardson said.

He stated that although the new material can be used to replace crude rubber, the fact that it can be made will not obsolete rubber plantations. This is true because tree rubber can, on the more efficient plantations, be produced for a much lower cost than the presently indicated cost of the new material. However, he pointed out that the new man-made rubber, when in production, will in effect place a ceiling on the price of crude rubber.

Shaw Appointed to New Post

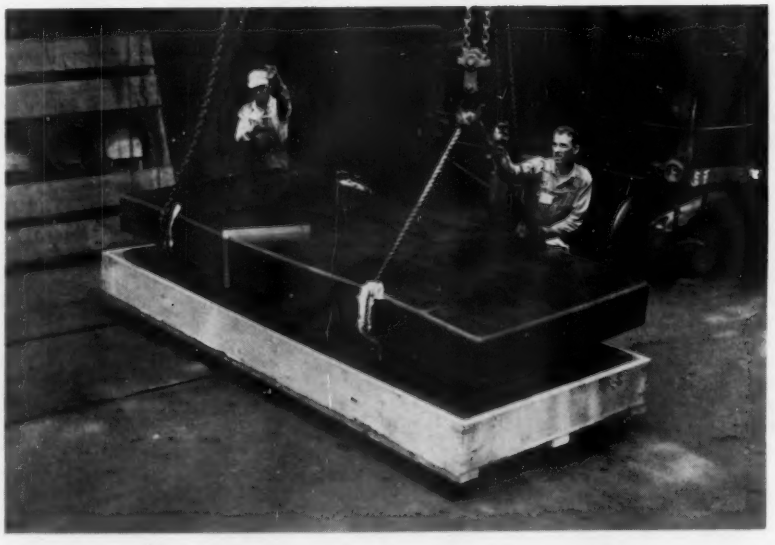
Elbert W. Shaw, formerly engaged in the purchase of synthetic rubber for the B. F. Goodrich Co., has been named managing director of Goodrich, Ltd., the parent company's natural rubber purchasing concern in the Far East. Mr. Shaw will make his headquarters in Singapore and will succeed John Stenger, who will return to the United States after completing a three-year assignment. After service in World War II, Mr. Shaw received his bachelor's degree from Kent State University and then joined B. F. Goodrich as a member of the chemical laboratory. Later, he worked in raw materials and in the Processing Division before becoming a synthetic rubber buyer about three years ago.

Rubber Industry Textbooks

About one year ago, the Institution of the Rubber Industry appointed a subcommittee, representative of almost every section of the industry, to examine the available range of textbooks on rubber and to make proposals for filling important gaps, particularly in books suitable to meet the needs of students. The group's first task was to decide what was wanted, and to find out, as far as possible, what books were already in preparation. The subcommittee decided upon these books as being urgently required at the student level: Two books on rubber technology, covering principles and manufacturing methods, at L.I.R.I. and A.I.R.I. standard, respectively, and a book on rubber chemistry and physics, preferably up to A.I.R.I. standard. IRI states that much material of this kind already exists in the form of lecture notes, and it was agreed to ask appropriate institutions for their cooperation. It has been reported that the response has been very satisfying, and it is likely that the staff of the National College and of the British Rubber Producers' Research Association will be able to provide what is needed. Attention has also been turned to a book on rubber science, at much the same level as "Davis and Blake." It seems probable, IRI states, that this may be sufficiently covered by works already in existence in other countries.

Tumb-L-Matic, Inc., New York, N. Y,. is offering a new bulletin entitled "Tumb-L-Matic Processes and Compounds for Tumbling Metal and Plastic Parts." Request Bulletin P-55.

U. S. RUBBER PRODUCES HEAVIEST HOMOGENEOUS FORMING PAD FOR BOEING



What is said to be the heaviest homogeneous forming pad ever made and cured in one piece, 4,650 pounds of vulcanized crude rubber, is shown above being hoisted for shipment to the Boeing Airplane Co., Seattle, Wash., where it will be used in a 5,000 ton hydraulic press to form aircraft panels and parts under a pressure of 1,100 pounds per square inch. The one-piece pad was manufactured by the Mechanical Goods Division of the U. S. Rubber Co. at its Passaic, N. J. plant. It is 11 inches thick and is 5 feet, 5⅛ inches wide by 12 feet, 6 inches long. The giant pad will enable Boeing to make many aircraft parts simultaneously or a huge piece at once.

FORT WAYNE MEETING FEATURES ADDRESSES BY LADD AND EMMETT

The December 2nd meeting of the Fort Wayne Rubber and Plastics Group, held at the Hotel Van Orman, Fort Wayne, Ind., featured two interesting papers, one by W. A. Ladd, chief physicist of the Columbian Carbon Co., and the other by R. A. Emmett, assistant technical director of the Binney & Smith Co. The meeting was attended by approximately 175 members and guests.

In his paper on "The Electron Microscope in Carbon Rubber Research," Mr. Ladd described the principles of the electron microscope and some of the pioneer work in constructing the several models. This relatively new device, he said, has greatly expanded knowledge of the nature of very fine material particles such as the carbon pigments.

The resolving power of the electron microscope is such as to reveal particles of super spectra black, having diameters measurable in millicrons. This is accomplished by means of beams of high velocity electrons, impelled by voltages up to 100,000 and focused with circular electromagnets. Magnifications up to 200,000 are obtainable, the speaker stated.

With this instrument, Mr. Ladd pointed out, much has been learned about the particle size, shape and clustering tendency of the various types of carbon black. Anticipated future work will be a study of the true nature of the rubber to carbon black surface bond.

Paper on Carbon Blacks

Mr. Emmett, in his paper on "Carbon Blacks—Important Components of Mechanical Rubber Goods," discussed the value to the practical compounder afforded by the increasing knowledge of carbon black pigments, their particle size, relative adsorbitive surface, chemical effects and dispersibility. Much of this knowledge has resulted from studies made with the electron microscope.

Mr. Emmett stated that black pigments range from the coarse thermal type blacks, intermediate furnace types, to the very fine channel, or impingement types. The available adsorbtive surface ranges from one acre per pound to 22 acres per pound of pigment, respectively. These relative areas give an approximate measure of the effective rubber reinforcement properties of the various blacks.

Other physical properties such as resilience, stiffness, abrasion resistance, heat buildup in mixing, extrudability, and electrical conductivity, are all of vital interest to the compounder of mechanical goods faced with a variety of specification requirements. The inter-relationships of these properties and effects were outlined by the speaker.

Coming Events in the Rubber Industry

Jan. 28. Akron Rubber Group, Winter Meeting, Mayflower Hotel, Akron, Ohio.

Jan. 31-Feb. 4. American Society for Testing Materials, Committee Week, Netherland Plaza Hotel, Cincinnati, Ohio.

Feb. 4-6. Boston Rubber Group, Ski Outing, Bartlett Hotel, Bartlett, N. H.

Feb. 4. Detroit Rubber and Plastics Group, Winter Meeting, Detroit Leland Hotel, Detroit, Mich.

Feb. 8-10. Society of the Plastics Industry, Reinforced Plastics Division Conference, Hotel Statler, Los Angeles, Calif.

Feb. 18. Chicago Rubber Group, Furniture Mart, Chicago, Ill.

Feb. 22-23. Society of the Plastics Industry of Canada, Thirteenth Annual Canadian Conference, Hotel London, London, Ontario.

Mar. 18. Chicago Rubber Group, Furniture Mart, Chicago, Ill.

Mar. 25. Boston Rubber Group, Spring Meeting, Somerset Hotel, Boston, Mass.

Apr. 1. Akron Rubber Group, Spring Meeting, Mayflower Hotel, Akron, Ohio.

Apr. 13-15. Society of the Plastics Industry, Pacific Coast Section Conference, Palm Springs, Calif.

Apr. 14-15. Chemical Institute of Canada, 6th Canadian High Polymer Forum, St. Catherines, Ont., Canada.

Apr. 29. Chicago Rubber Group, Furniture Mart, Chicago, Ill.

May 4-6. Division of Rubber Chemistry, A.C.S., Spring Meeting, Sheraton-Cadillac Hotel, Detroit, Mich.

May 7-15. Society of the Plastics Industry, Annual Meeting and Conference, Cruise on "Queen of Bermuda."

June 17. Akron Rubber Group, Summer Outing, Firestone Country Club.

June 17. Boston Rubber Group, Summer Outing, Andover Country Club, Andover, Mass.

June 19-23. American Society of Mechanical Engineers, Diamond Jubilee Semi-Annual Meeting, Hotel Statler, Boston, Mass.

June 24. Detroit Rubber and Plastics Group, Annual Golf Outing, Western Golf and Country Club, Detroit, Mich.

June 26-July 1. American Society for Testing Materials, Annual Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Oct. 7. Detroit Rubber and Plastics Group, Fall Meeting, Detroit Leland Hotel, Detroit, Mich.

Oct. 14. Boston Rubber Group, Fall Meeting, Somerset Hotel, Boston, Mass.

Nov. 2-4. Division of Rubber Chemistry, A.C.S., Fall Meeting, Bellevue-Stratford Hotel, Philadelphia, Penna.

Dec. 9. Detroit Rubber and Plastics Group, Annual Christmas Party, Sheraton-Cadillac Hotel, Detroit, Mich.

Dec. 16. Boston Rubber Group, Xmas Party, Somerset Hotel, Boston, Mass.

Rubber-Dipt Products Moves

Rubber-Dipt Products, Inc., formerly located in Yonkers, N. Y., has moved to new and larger quarters at 160 Midland Avenue, Port Chester, N. Y. The new telephone number is: WEstmore 9-1353.

Ontario Section Hears Gerrie

The December 14th meeting of the Ontario Rubber Section of the Chemical Institute of Canada, held at the Collins Hotel, Dundas, Ont., Canada, featured both the Annual Christmas Party and the presentation of a paper by R. D. Gerrie of Francis Shaw & Co., Ltd., Toronto, Ont. Mr. Gerrie spoke on the subject, "Rubber Processing Equipment." The speaker discussed only the Shaw "Intermix" machine, which was designed in 1932 to overcome some of the problems of internal mixers. Mr. Gerrie said that the Intermix claims the following advantages: (1) Roller bearings outside mixing chamber, which is said to allow for more cooling surface around the sides of the mixer, and results in better control of the temperature of the mix. Batches are dumped 30 to 40° cooler. This also allows for better dust sales; (2) Two piece rotors (shaft—high tensile steel—rotor—high abrasion steel). This eliminates excessive wear on the rotors, and results in fewer broken shafts; (3) Because of the rotor and mixing chamber design of the Intermix, more of the mixing is done between the two rotors, and less between rotors and chamber walls. This results in less wall wear, the speaker declared. A report on the Christmas Party will be found elsewhere in this issue.

Akron Group Plans Symposium

The January 28th meeting of the Akron Rubber Group at the Mayflower Hotel in Akron, Ohio, will feature a symposium on "Protective Materials for Rubber Products —Antioxidants, Antiozonants and Waxes." The panelists will include experts from major suppliers to the rubber industry who will answer previously submitted questions.

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RUBBER GROUPS ABOUT THE COUNTRY HOLD ANNUAL CHRISTMAS MEETINGS

The various rubber groups about the country brought 1954 to a close with the traditional Christmas meeting. Group members and their guests enjoyed programs which included special dinners, drawings for door prizes, entertainment and dancing. In some cases, officers were elected for the new year. The following groups have reported on their activities during the holiday season:

BOSTON RUBBER GROUP

The Winter Meeting and Christmas Party of the Boston Rubber Group was held on December 10 at the Somerset Hotel in Boston, Mass. The Tellers Committee reported that the following members had been elected to office for 1955: *Chairman,* Edwin D. Covell (Stedfast Rubber); *Vice-Chairman,* James E. Williamson (Tyer Rubber); *Secretary-Treasurer,* Arthur I. Ross (American Biltrite). The board of directors for 1955 consists of Messrs. Covell, Williamson and Ross, while the Executive Committee includes David Kirkpatrick (Boston Woven Hose), Roger Stellar (Goodrich Chemical), W. Fraser Malcom (Titanium Pigment), and Walter Edsall (Goodyear). The Christmas Party consisted of a cocktail hour followed by a dinner and the distribution of door prizes. A program of entertainment was also provided.

BUFFALO RUBBER GROUP

The Annual Christmas Party of the Buffalo Rubber Group held on December 8th at the Trap and Field Club in Buffalo, N. Y., was attended by approximately 160 members and guests. Officers were elected for the new year, including: *Chairman,* Charles Johnson (Hewitt-Robins); *Vice-Chairman,* Paul Schwert (Dunlop Tire); *Secretary-Treasurer,* Charles Wahl (Hewitt-Robins). The following members were elected as directors and comprise the Executive Committee: John Helwic (Dunlop Tire), Frank Niemczyk (Buffalo Weaving & Belting), Daniel Gabala (Price & Stevens), Jean Nesbit (U.S. Rubber Reclaiming), Joe Schutz (Dunlop Tire), and Norman Fleischman (Buffalo Weaving & Belting). A special Christmas dinner was served at the party and entertainment was provided by a thirty voice male chorus. Interesting door prizes were also distributed at the party.

CHICAGO RUBBER GROUP

The Chicago Rubber Group held its Annual Christmas Party on December 17th in the Morrison Hotel in Chicago, Ill., with over 800 members and guests in attendance. The party featured a cocktail hour, dinner, entertainment and dancing. Every lady present received a beautiful gift. Frank E. Smith (Williams-Bowman) was chairman of the Party Committee, with John F. Swart (Van Cleef) as vice-chairman. Morris O'Conner (O'Connor & Co.) and Grant Sweet (Williams-Bowman) handled the ticket and seating arrangements. John D. Saunier (G-E) and John J. Lawless (DuPont) were in charge of gifts. George Smith (Williams-Bowman) was in charge of contributions, and the Entertainment Committee consisted of William Urbanek (Dryden Rubber) and Gerry G. Kraft (Kraft Chemical).

DETROIT RUBBER GROUP

Over 800 members and guests attended the Annual Christmas Party held by the Detroit Rubber and Plastics Group on December 10 at the Sheraton-Cadillac Hotel in Detroit, Mich. Attendance at the meeting set a new high for the group. The following members have been elected to office for 1955: *Chairman,* J. T. O'Reilly (Ford); *Vice-Chairman,* H. W. Hoerauf (U.S. Rubber); *Secretary,* H. F. Jacober (Baldwin Rubber); *Assistant Secretary,* E. W. Tillitson (Wayne University); *Treasurer,* W. F. Bauer; *Assistant Treasurer,* D. A. Koza (Automotive Rubber) and J. B. Ledden (DuPont).

The following members have been named to the positions noted for the coming year: E. J. Kvet, Jr. (Detroit Arsenal), program chairman; W. D. Wilson (R. T. Vanderbilt), assistant program chairman; S. R. Schaffer (U.S. Rubber), assistant program chairman; W. A. Wiard (Dow Corning), membership chairman; W. F. Miller (Yale Rubber Mfg.), assistant membership chairman; R. W. Malcolmson (DuPont), publicity chairman; C. F. Nixon (General Motors), assistant publicity chairman; R. C. Chilton (Permalastic Products), entertainment chairman; J. B. Craft (General Tire), assistant entertainment chairman; J. F. Stiff (Binney & Smith), educational chairman; L. A. Jarvis (Wyandotte Chemicals), assistant educational chairman; J. D. Skandalaris (Chrysler), educational committee; E. M. Chmiel (Minnesota Mining), educational committee; T. W. Halloran (Chemical Products), historian; G. P. Hollingsworth (Minnesota Mining), counselor; E. V. Hindle (U.S. Rubber), counselor; W. J. Simpson (Chrysler), counselor.

NEW YORK GROUP

Approximately 500 members and guests of the New York Rubber Group attended the Annual Christmas Party held on December 10 at the Henry Hudson Hotel in New York City. The program for the party consisted of a cocktail hour followed by the serving of a dinner, a program of entertainment and the distribution of many handsome and valuable prizes. The affair was made possible by the generous contributions of more than ninety suppliers and others. Officers who served the group in 1954 were given a vote of thanks and group members were introduced to the officers who will take over for the 1955 season.

NORTHERN CALIFORNIA GROUP

The Northern California Rubber Group held its 12th Annual Christmas Party on December 18th at the Oakland Wilows in Oakland, Calif. The party featured the introduction of the new officers of the group for 1955. Members elected to office include: *President,* Halsey Burke (Burke Rubber); *Vice-President,* Leonard Evans (Mansfield Rubber); *Secretary,* Eugene Gador (Oliver Tire); *Treasurer,* Stanley Mason (Quaker Rubber). The following members were elected to the board of directors: Claude Corkadel (Oliver Tire), Drace Kutnewsky (Burke Rubber), and Ralph Hickox (Goodyear). The program for the party consisted of dinner, dancing, and the distribution of door prizes. L. Evans (Mansfield Tire) served as chairman of the Party Committee. G. Ashcroft (B. E. Dougherty) was in charge of announcements, while Miss Ruth Hatch (Mansfield Tire) was responsible for the selection of ladies' gifts. G. Farwell (Goodyear Rubber) was charged with the solicitation of funds for the party. Miss Hatch and Mr. Mason acted as hostess and host of the party. Santa Claus and his helper were believed to be J. Elwood (Monsanto) and Mrs. Elwood.

ONTARIO RUBBER SECTION

The Ontario Rubber Section of the Chemical Institute of Canada held its Annual Christmas Party on December 14 at the Collins Hotel in Dundas, Ont., Canada. The meeting featured the serving of a turkey dinner and a drawing for door prizes which were won by Gerry Ray (Canadian Resinous Products), Harold Green (Dominion Rubber), Al Crapper (Canadian Titanium Pigments) and T. Smith (Firestone). A technical portion of the meeting was devoted to an address by R. D. Gerrie of Francis Shaw & Co., Ltd., Toronto, Ont., Canada. A report on this technical portion of the meeting will be found elsewhere in this issue.

SOUTHERN OHIO GROUP

The Southern Ohio Rubber Group held its Eighth Annual Winter Meeting on December 18 at the Miami Valley Golf Club, Dayton, Ohio. Approximately 260 members and guests were served a filet mignon dinner. Ladies present received a jeweled billfold as a gift and in addition, sixty-three door prizes were distributed. After dinner, members and guests played cards and danced. The Winter Meeting Committee consisted of Daniel A. Meyer, chairman, and I. Louis Wolk, A. M. Wightman, E. W. Moorman, S. R. Prance, E. L. Cutrell, J. W. Shrontz, George Hobach, D. M. Jordan and Paul E. Ludy.

WASHINGTON RUBBER GROUP

Approximately 95 members and guests attended the Annual Christmas Party held by the Washington Rubber Group on December 15 at the Carillon House in Washington, D. C. The Arrangements Committee was headed by Ted Scanlan (Gates Rubber). A group of committee hostesses handled table settings and provisions. This group included Rachel Fanning, Nan Sears, Dot Reibel, Vicki Collins and Vicki Devereaux. Door prizes were distributed to holders of lucky numbers at the meeting.

JUSTICE DEPARTMENT MOVES TO KILL TIRE FIRMS' CASE

The U. S. Justice Department has informed the group of tire companies fighting a Federal Trade Commission discount rule that it will seek a summary judgment which, if granted, would throw out the tire firm's case. Albert Parker, special assistant to the Attorney General, notified attorneys for Goodyear, Firestone, Goodrich and U. S. Rubber, as well as other tire companies, oil firms, mail order houses and distributors.

The probable effect of the Justice Department move will be to force the companies to explain to a federal judge why their suit should not be dropped. The firms have asked the courts to erase an FTC ruling limiting the top discount to the amount offered on a single carload of tires or tubes. The firms state that the discount ruling disrupts their business and would cut off some of their best customers, including mail order and gasoline station chains. The ruling is not in effect pending outcome of the case.

Mr. Parker said that his motion for a summary judgment will be based on the contention that the FTC rule was set up by constitutional and rational procedure. If the court agrees, the rule automatically is not subject for review and the tire firms lose their case, he said. If the motion is denied, Mr. Parker says it will be appealed to the United States Supreme Court if necessary.

The companies will fight the motion. They state that questions of both law and fact are involved in their case which should be heard in due course on its merits. They are expected to argue that practical questions on whether they received a proper hearing by FTC must be considered.

Mr. Parker said his motion would restrict the case to the public record and cut off new testimony. He will also ask the companies to have their parallel cases consolidated for hearing on his motion.

Planning Philippine Plant

According to recent reports, the International Division of the B. F. Goodrich Co. is seeking permission from the Philippine government to erect a tire factory in that country. *The Manilla Chronicle,* a Philippine newspaper, reported that L. C. Hayden, head of Goodrich operations in the Philippines, had called on President Magsaysay requesting early approval of an application by Goodrich International Rubber Co. of the Philippine Islands, to establish a $6,000,000 tire plant. It would employ no less than 1,000 employees. Most of the tires sold on the islands are now imported. There is one small domestic plant. Goodrich, as well as Goodyear and Firestone have sales organizations there. Goodyear also operates a rubber plantation in the islands.

Firestone has also announced plans to construct a tire plant in the Philippines, with an investment to run into the "millions." A representative has called on the Philippine president requesting permission for the construction of the plant.

Hood Presents Service Awards

Raymond H. Blanchard (left), president of the Hood Rubber Co., Watertown, Mass., is shown here presenting James S. Barrie (center), vice-president in charge of sales and distribution, with a wrist watch, one of 209 distributed to Hood employees in recognition of 30 or more years' service. Harold B. Leland (right), vice-president in charge of manufacturing, Mr. Blanchard and Mr. Barrie personally distributed 247 awards throughout the Watertown plant to the individual recipients a few days before Christmas. The new Service Award Plan inaugurated in 1954 by the B. F. Goodrich Co., of which Hood Rubber is a division, is retroactive and the many additional employees eligible will receive their awards during the next four years. Mr. Blanchard and Mr. Leland each have more than 30 years' service with the company. A beautiful silver tray or a choice of several models of watches is the award for 40 years' service. A watch for 30 years' service and a pen and base desk set for 20 years' service are the awards given.

DuPont-Nopco Suit Pending

A suit against the Nopco Chemical Co. by E. I. du Pont de Nemours & Co., Inc., charging infringement of the DuPont patent to produce isocyanate foam plastics is reportedly scheduled for an early hearing before the U. S. District Court at Newark, N. J. Nopco Chemical, a licensee under patents held by the Lockheed Aircraft Corp., in its reply to DuPont, denies that it has committed any infringement and asserts that the DuPont patent is invalid because of prior knowledge about polyurethanes. In an 18-page answer and counterclaim, Nopco is asking the court to dismiss the suit, declare the DuPont patent invalid and not infringed, and enjoin DuPont from cutting off, or threatening to cut off the supply of organic diisocyanates as a means of inducing anyone to buy a license. Nopco stated that after two and one-half years of development work, its foam products are "well advanced in many practical applications" and adds that an "intensive study" of the patents shows that the DuPont patent doesn't cover these applications.

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QUEBEC GROUP HEARS McCUNE SPEAK ON HYPALON PRODUCTS

Approximately 65 members and guests of the Quebec Rubber and Plastics Group attended the November 18th meeting held at the Queen's Hotel in Montreal, Que., Canada. Featured speaker of the meeting was S. W. McCune of E. I. du Pont de Nemours & Co., Inc. Mr. McCune spoke on "Development of Products of Hypalon Chlorosulfonated Polyethylene," and illustrated his talk with slides.

The speaker stated that since the introduction of Hypalon, laboratory and factory evaluations have demonstrated that compounds of the material possess such outstanding properties as: (1) Complete resistance to ozone; (2) Superior heat resistance; (3) Excellent weather resistance; (4) Excellent color stability, and (5) Superior chemical resistance. These properties, he said, combined with the mechanical properties of Hypalon compositions serve to make the polymer an excellent candidate in the elastomer field.

Mr. McCune stated that Hypalon is being tested in a wide variety of finished products. Some of these are being produced on a commercial scale and others are still in the experimental stage of development. Results of laboratory and field evaluation tests have demonstrated that the properties of Hypalon are advantageous under a wide range of service conditions. Limited commercial quantities of Hypalon are now being manufactured in an interim plant and plans are being made to produce the material on a full-scale commercial basis, the speaker revealed.

Valvair Opens New Plant

Sinclair-Collins Valve Co. and the Valvair Corp., have announced the opening of a new plant in Canton, Penna. The new plant will operate under the manufacturing name of Collins Valve, Inc. Collins Valve, Inc. is located about 35 miles south of Elmira near the New York State border and 38 miles north of Williamsport, Penna. Collins Valve will avail itself as a main production center for the eastern customers whereas the present location of Valvair and Sinclair-Collins will be the main production center for the midwest and western customers. Collins Valve will have approximately 12,000 square feet of floor space with the most modern facilities in lighting, equipment and offices. Engineering sales and administrative offices will remain in Akron, Ohio. The new company will be in production February 1, 1955, it was stated.

Rubber Fabricators Formed

R. C. Flemming, formerly associated with the New York Rubber Corp. at Beacon, N. Y., has formed Rubber Fabricators, Inc., Grantsville, West Va., for the manufacture of inflatable rubberized products, including life rafts, life preservers and similar items. At the present time the company is engaged in the manufacture of a submarine type preserver for the U. S. Navy. Mr. Flemming is serving the new company as president.

KERITE COMPANY CELEBRATES ONE-HUNDREDTH ANNIVERSARY

The year 1954 marked the 100th anniversary of the Kerite Co. of Seymour, Conn., major producer of insulated wire and cable. With a history dating back to Charles Goodyear, the earliest predecessor of The Kerite Co. was the A. G. Day Caoutchouc Co. of New Haven, Conn., founded by Austin Goodyear Day. A cousin of Charles Goodyear, Mr. Day had been associated with him at the Woburn, Mass., plant as correspondent and bookkeeper, prior to forming his own company.

While in Goodyear's employe, Day spent much time in the study of India rubber, its physical and chemical properties, and the processes of manufacture. The association with Goodyear continued for twelve years, at which time, in conjunction with his brothers and father, Day founded the A. G. Day Caoutchouc Co. In 1854, the company moved to a former paper mill in Seymour, Conn., site of The Kerite Co., today.

The main income of the new company was derived from cleaning large quantities of rubber for use in neighboring rubber plants. The company purchased crude rubber in New York, shipped it to Derby, Conn., by barge and hauled it by oxcart to Seymour for refining, and then on to the rubber plants in the area.

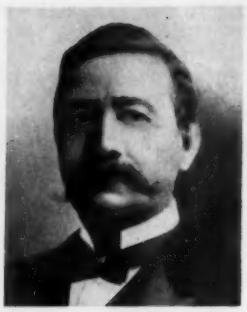
Products Manufactured

Manufactured products of the new company were hard rubber articles, licensed under the 1851 patent of Charles Goodyear's brother Nelson, and included such items as drug sundries, pen holders, pencils, battery cells, bridle bits, trumpet mouthpieces and handles. The hard rubber business was directed by H. P. and E. Day, brothers of A. G. Day, in the Kerite factory until 1903. From 1884, the principal customer for the hard rubber products produced by the concern was the Waterman Pen Co. (Waterman purchased The H. P. Day Co. in 1946).

In 1856, A. G. Day hired Alva Goodrich DeWolfe as plant superintendent—a decision which proved to be of real advantage to the young organization. With a background as a machinist and engineer, DeWolfe, at an earlier date, had become associated with Henry Goodyear and in 1855 moved to Beacon Falls, Conn., as superintendent of the H. B. Goodyear factory.

A. G. Day

A. G. DeWolfe



W. R. Brixey

A. G. Day and DeWolfe soon began casting about for new products. A common problem of the time was the need for a good insulating material to be put on telegraph wires. The efforts of Day and DeWolfe were directed to perfecting an insulation for telegraph wire. Destruction of the Seymour factory by fire in 1864 delayed their experiments until a new and larger building was completed in 1865.

It was A. G. Day's inventiveness and experience in compounding, teamed with Alva DeWolfe's mechanical genius, that enabled them to produce the first insulated wire to be extruded with a compound containing rubber. This insulating material was made possible only because A. G. Day developed and manufactured the unique compound called "Kerite" which, when mixed with rubber, gave the finished product the outstanding physical and electrical properties necessary for the first all-purpose insulated wire to be produced in this country.

Thus, with the Kerite compound, the young company was on its way to a brand new business. By 1868, at least two hundred installations of Kerite telegraph wire had been made in the United States and Canada—underground, in water, and on pole lines.

Receives Various Honors

The Paris Universal Exposition of 1867 awarded two medals and an honorable mention to the Kerite compound. The acceptance of Kerite insulated wire was almost instantaneous. In 1869, the Western Union Telegraph Co. installed a Kerite cable under the Chicago River and five years later reported that "it shows no signs of decay or deterioration". A Kerite telegraph cable placed along the footwalk of the Brooklyn Bridge in 1875, was taken down in 1880 and placed on the Brooklyn elevated where it continued in service for many years.

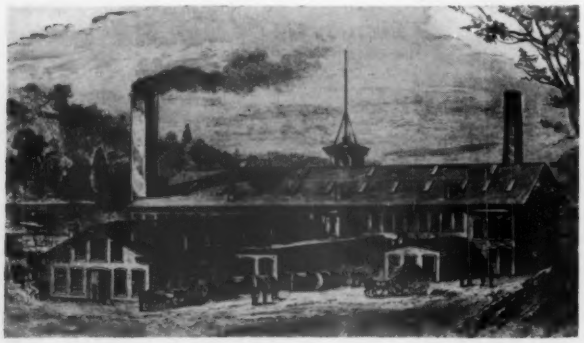
Austin Goodyear Day died in 1889, and the business was continued by Mrs. Day with her brother, William R. Brixey, as general manager. Following Mrs. Day's death in 1892, the business was left to Brixey, who changed the name of the company to W. R. Brixey, Esq., Mfgrs. of Kerite Wire and Cables.

During W. R. Brixey's administration, a number of notable Kerite installations were made outside of the United States. In 1900, two different armored cables were made for telegraph communication in Alaska. In 1908, the first telegraph cable was put along the then unfinished Panama Canal. This cable has now been in service for forty-six years. The Pennsylvania Railroad was using Kerite wire as early as 1880.

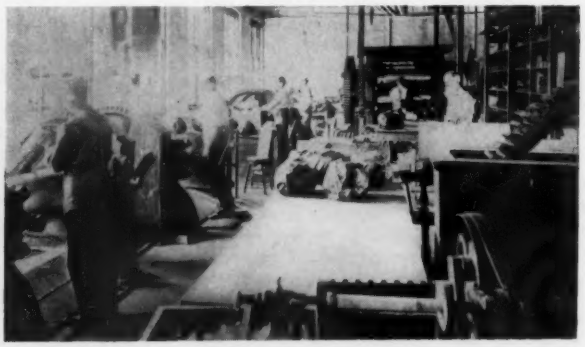
Company Name Changed

W. R. Brixey was seriously injured in the subway explosion at the Murray Hill Hotel in New York City in 1902, and much of the active management of the company was left to his eldest son, Richard DeWolfe Brixey. In 1908, R. D. Brixey changed the name of the concern to the Kerite Insulated Wire & Cable Co., and in 1911, following the death of his father, he became president of the firm.

The Seymour factory, when R. D. Brixey became president, had about 50,000 square feet of manufacturing space. At the time of his death in 1943, this had increased to aproximately 250,000 square feet. During his tenure as president, R. D. Brixey established the company's sales or-



Kerite plant circa 1870



Plant compound room in the 1880's

C. R. R. Harris

R. D. Brixey

ganization. In the early days of his presidency, Mr. Brixey hired C. R. R. Harris to act as his engineering and administrative assistant. One of the first jobs Mr. Harris had with the company was to design and supervise the manufacture and installation of Kerite cable across the Isthmus of Panama during World War I.

In 1928, R. D. Brixey suffered a heart attack and had to assume a less active roll in the management of the company. Mr. Harris, who had been made a vice-president and a director in 1927, took over more and more of the responsibilities of running the company.

After R. D. Brixey's death, C. R. R. Harris was elected to the presidency of the company, a position he still holds. He came into this position at a time when the country was well into World War II. One of the most outstanding contributions The Kerite Co. made to the nation's defense during this period was the development and manufacture of cables for the Manhattan Project at Oak Ridge, Tenn.

In 1945, the trustees of the estate of R. D. Brixey decided that the company should be sold as there was need for the liquidation of assets because of inheritance taxes. All of the outstanding stock of the company was sold to the Lee Higginson Corp. Mr. Harris was re-elected as president and treasurer, and the name of the company changed to The Kerite Co.

Since Mr. Harris became president, the second great expansion and rebuilding period of the firm has been accomplished. 74,355 square feet of manufacturing area were added and many building improvements made in other structures. From the period 1943-53, building expenditures totaled $662,132, and machinery expenditures amounted to $1,002,076.

This expansion program was developed with two basic ideas in mind, namely: (1) To modernize the plant manufacturing facilities in order that Kerite might turn out a better product more efficiently; and (2) To expand those departments where, because of product design change, the firm was pushed beyond its capacity in taking care of its regular customers.

The history of The Kerite Co. is the story of the growth of an industry and the people who have contributed to that growth. Kerite is proud of its one hundred years in business, and proud of its organization and modern facilities which enable the company to enter its second century of business with the assurance of continuing the tradition of service to its customers.

EDITOR'S NOTE: As this issue went to press, The Kerite Co. announced that on December 28, 1954, C. R. R. Harris, formerly president of the company, had been elected chairman of the board and chief executive officer, while Theodore O. Rudd, a vice-president of the company since 1945, had been elected president. Mr. Harris will continue as treasurer of the company in addition to his new duties. Mr. Rudd has been a director of The Kerite Co. since 1946.

Agreement Ends Trust Suit

The government's seven-year old civil anti-trust suit against National City Lines, Inc., was settled by agreement of both parties in Federal Court in Chicago, Ill., on December 14. The court, with consent of the company, entered a decree requiring the transportation company to take competitive bids for supplies of petroleum products and tires. National operates urban and interurban bus lines throughout the nation. Five former stockholder suppliers of National, named co-defendants in the suit, were not involved in the agreement. The suit charged that National had agreed to buy substantially all its buses, tires and petroleum products from the five co-defendant companies in return for their financial assistance. Originally, the suit asked an injunction perpetually enjoining National from buying its buses, tires, and petroleum products without taking competitive bids. It sought also to compel the company to divest itself of its stockholdings in certain local transit companies. The decree entered by the court does not require National to ask competitive bids for buses or to dispose of its stock in any local transit lines. Attorneys for the Anti-Trust Division said they would go ahead with the suit against the other defendants, General Motors Corp., Firestone Tire & Rubber Co., Phillips Petroleum Co., Standard Oil of California, and Mack Manufacturing Co. The government seeks to enjoin these companies from giving financial assistance to National or any other concerns to which they sell supplies. Counsel for National told the court the five suppliers had disposed of the stockholdings in National some time ago.

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Consolidated Made F-B Division

Consolidated Machine Tool Corp., Rochester, N. Y., a wholly-owned subsidiary of the Farrel-Birmingham Co. Inc., Ansonia, Conn., has been dissolved as a separate corporation and, effective January 1, 1955, its business and activities will be conducted as a division of the parent corporation. This announcement, made by Franklin Hoadley, president of Farrel-Birmingham and Lester D. Chirgwin, president of Consolidated, stated that the new division will be operated as the Consolidated Machine Tool Co., a division of Farrel-Birmingham Co., Inc. Activities will continue in the Rochester division as before and management will remain the same.

Farrel-Birmingham acquired Consolidated Machine Tool as a wholly-owned subsidiary in December, 1951, by purchase of the common stock from its former owner, the late Arthur H. Ingle. Mr. Ingle had formed the Consolidated Corp. in 1922 by merging the interests of several well known machine tool builders, some of which date back nearly to the time Farrel-Birmingham was founded, well over a century ago. Shortly after the purchase, Mr. Ingle became a director of Farrel-Birmingham, and he remained on the board until his passing July 1, 1954.

During the past three years Consolidated has maintained high production of important machine tools, but meanwhile Farrel-Birmingham has been able to integrate production in Rochester with production in the company's other plants at Ansonia and Derby, Connecticut and Buffalo, N. Y. The result of pooling facilities, insofar as has been practical, has benefited the output of all four plants and has aided the parent company and Consolidated Machine Tool in improving service to customers for all lines of products, consisting of the wide variety of machine tools built at Rochester and the diversified lines of heavy machinery designed and built by Farrel-Birmingham. This current move, as stated by Mr. Chirgwin, is for the purpose of simplifying the administration of the company and will entail no physical changes other than some minor changes in the accounting and billing departments.

Carbide Announces Flexol 426

"Flexol Plasticizer 426," a distilled, mixed alcohol phthalate, has just become available in tank car quantities from the Carbide and Carbon Chemicals Co., New York, N. Y. This new phthalate has high solvent power for vinyl chloride resins, is stable to heat and light, and imparts good low-temperature properties to vinyl plastics, the company states. It is also compatible with nitrocellulose, chlorinated rubber and acrylate polymers. Flexol 426 is more volatile than dioctyl phthalate but it can be used in many products that do not require the performance of premium plasticizers such as Flexol Plasticizers DOP, 810 or 812. In general, 426 can be used to improve processing characteristics of vinyl compounds. These include vinyl flooring, profile extrusions, wire insulation and cable jackets. When low volatility is not a prime requisite, it can be useful in film, sheeting and plastisols.

NEW POLYMERS AUTHORIZED BY OFFICE OF SYNTHETIC RUBBER, FEDERAL FACILITIES CORPORATION

Listed below are types and properties of new experimental GR-S polymers (including GR-S latices) which have been authorized by the Office of Synthetic Rubber, Federal Facilities Corporation, since publication of those in our previous issue. Procedures for the distribution and sale of the polymers will be found in our October, 1945, issue. Normally, experimental polymers will be produced only at the request of the consumers and 20 bales (one bale weighs approximately 75 pounds) of the original run will be set aside if possible for distribution to other interested companies for their evaluation. The 20 bales when available will be distributed in quantities of one or two bales upon request to the Synthetic Rubber Sales Division or will be held for six months after the experimental polymer was produced unless otherwise consigned before that time. Subsequent production runs will be made if sufficient requests are received to warrant them.

X No.	*Polymer Description*	*Remarks*
X-764 GR-S	A masterbatch of 20 parts medium abrasion furnace black and 100 parts base polymer—approximately 8.0% bound vinyl pyridine, sugar-free iron activated, fatty acid soap emulsified, 41°F. reaction temperature, 85% conversion, carbamate shortstopped, staining stabilizer, acid coagulated. Mooney of base polymer approximately 20 ML-4 at 212°F.	X-764 was a special polymer produced only once. The inventory of X-764 has been depleted and no further production is contemplated.
X-765 GR-S Latex	A low temperature polymerized medium solids butadiene-styrene copolymer latex identical with GR-S 2101 (X-617) except it is heat concentrated to 38.0-41.0% total solids.	Except for the higher solids, quality characteristics comparable to GR-S 2101. X-765 developed as possible replacement for GR-S 2101. At end of six months' evaluation period (March, 1955), if consumer findings are favorable, X-765 will be assigned a permanent number and GR-S 2101 abolished. If consumer evaluations are unfavorable, X-765 will be abolished.
X-766 GR-S	A masterbatch of 37.5 parts aromatic type processing oil and 100 parts base polymer—approximately 23.5% bound vinyl toluene, sugar-free iron activated, 50/50 rosin/fatty acid soap emulsified, 41°F. reaction temperature, carbamate shortstopped, staining stabilizer, salt-acid coagulated. Mooney of masterbatch 45-55 ML-4 at 212°F.	Identical with GR-S 1710 except vinyl toluene replaced styrene in the base polymer. Previous work indicated that the butadiene-vinyl toluene copolymer was comparable to the butadiene-styrene copolymer. Therefore, as vinyl toluene is now commercially available, X-766 was produced to permit large scale evaluations by both the producing plant and consumers for the purpose of establishing vinyl toluene as an alternate monomer in case of an emergency. X-766 has been produced once and no further production is contemplated.
X-767 GR-S Latex	A low temperature polymerized high solids butadiene-styrene copolymer latex 65/35 rosin/fatty acid soap emulsified, sulfoxylate activated, carbamate shortstopped. Stabilizer soap—potassium oleate. Bound styrene of contained polymer approximately 40.0%, mean Mooney of contained polymer 140 ML-4 at 212°F. Latex heat concentrated to 60.0% minimum.	Identical with GR-S 2105 latex (X-758) except for higher bound styrene content. X-767 should have improved film properties because of the higher bound styrene and the sulfoxylate activation result in a latex with better color characteristics. Should be of particular interest in applications where X-633 and X-710 have been used. X-767 will be assigned a permanent number at the end of a six months' evaluation period (May, 1955) if consumer findings are favorable and demand sufficient to warrant continued economic production runs.

NOTE: The above new polymers are experimental only and the Office of Synthetic Rubber, Federal Facilities Corporation, does not make any representation or warranties of any kind, express or implied, as to the specifications or properties of such experimental polymers, or the results to be obtained from their use.

Ozone Resistance of Butyl

According to the Kenrich Corp., Maspeth, L. I., N. Y., recent investigations have indicated that the addition of "Kenflex A" to Butyl imparts a marked improvement to ozone resistance. Kenflex, a synthetic aromatic hydrocarbon resin, used as a highly efficient processing aid in all rubbers, has no effect on Butyl cure. The incorporation of Kenflex, it is stated, also imparts resistance to heat aging and exhibits excellent electrical characteristics. Technical data and samples are available from the company at 57-02 48th Street, Maspeth 78.

Neville Chemical Names Two

Neville Chemical Co., Pittsburgh, Penna. has announced the appointments of Donald L. Marsh and William T. Cloake as technical representatives of its Sales Department. Both Messrs. Marsh and Cloake have been with Neville in research capacities for a number of years. Their addition to the Sales Department reflects the company's policy of customer service in its broadest aspects.

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Lee Rubber Tubeless Tires

Lee Rubber & Tire Corp., Conshoken, Penna., has entered the field of tubeless and nylon constructed tires with the introduction of three new models for passenger car use. The new Lee Rubber "Super Deluxe Tubeless" is designed to replace original equipment tires. The new "Super Deluxe" nylon tire will compete in the so-called "120-line" of tire manufacturers; while the new "Double-Life All-Nylon Tubeless" is said to be a premium quality passenger tire "with improved features over other tubeless models now on the market".

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NAMES IN THE NEWS

DR. RAY E. HEIK, associated with the Battelle Memorial Institute since 1942, has been placed in charge of sponsor relations in the Institute's Department of Chemistry.

JOSEPH THOMAS, secretary and general counsel of the Firestone Tire & Rubber Co., has been appointed to the board of directors of the University of Akron succeeding LEE R. JACKSON, president of Firestone, who has resigned.

I. C. ALSPACH, associated with the Goodyear Tire & Rubber Co. since 1927, has been named manager of the Near Eastern and African Division of the Goodyear Tire & Rubber Export Co. A. C. THORN has been named to succeed Mr. Alspach as manager of the export company's Industrial Products Department.

LYLE E. KING, formerly an associate economist for E. I. du Pont de Nemours & Co., Inc., has been named to the newly-created post of market research manager for the company's Rubber Chemicals Division.

C. HERMAN BEHRLE, associated with the B. F. Goodrich Co. since 1936, has been named assistant manager of passenger tire sales for the Tire and Equipment Division.

W. R. BALL, formerly associated with the U. S. Rubber Co., has been named chief chemist of the Sponge Rubber Products Division of the B. F. Goodrich Co. at Shelton, Conn.

WILLIAM G. LEVANS, until recently associated with the Parker Appliance Corporation, has joined the Goshen Rubber Co., Goshen, Indiana, in a research and development capacity.

WILLIAM R. LANTZ, vice-president in charge of purchasing for the Sun Rubber Co., has been elected to the board of directors of the Toy Manufacturers of the U.S.A., Inc.

EDWARD W. OED, associated with the U. S. Rubber Co. since 1930, has been elected an assistant treasurer of the company.

H. D. MCGOWAN, formerly associated with the General Chemical Division of the Allied Chemical & Dye Corp., has been appointed assistant director of market development for the Stauffer Chemical Co.

EDNA TURNBULL, associated with the Boston, Mass., office of Stein, Hall & Co., Inc., has retired after more than 46 years of service.

SYDNEY T. ELLIS, associated with the Commercial Solvents Corp. since 1951, has been named executive vice-president. He has been a director since 1953.

G. F. D'ALELIO, vice-president and manager of research for the Koppers Co., has been named head of the Chemistry Department at Notre Dame. The appointment is effective February 1.

RALPH H. MINER, assistant secretary of the Goodyear Tire & Rubber Co., and manager of the Tax and Insurance Department, has been elected president of the Ohio Manufacturers' Association for 1954.

WILLIAM O. FAXON has joined Tracerlab, Inc., Boston, Mass., in the newly-created position of executive vice-president. Mr. Faxon has also been elected a director of the company.

VICTOR HOLT, JR., vice-president in charge of tire sales for the Goodyear Tire & Rubber Co., was recently presented a service pin by the company on his completion of 25 years' service.

J. WARD KEENER, vice-president of the B. F. Goodrich Co., Akron, Ohio, has accepted an invitation to serve during 1955 on an advisory committee to the U. S. Army on its world-wide civilian personnel management program.

EDWIN C. EVANS has been appointed vice-president and assistant general manager of the Behr-Manning Corp., Troy, N. Y., and WILLIAM I. CLARK, JR., has been named assistant to the president in addition to his present duties as secretary of the company.

H. E. HUMPHREYS, JR., president of the U. S. Rubber Co., has been appointed vice-president of the Eastern Division of the National Association of Manufacturers.

Angier Opens Western Division

Angier Products, Inc. of Cambridge, Mass., has announced the opening of their new Western Division. Located at Huntington, Ind., the newly-constructed plant is ideally situated for even more prompt and effective service of midwestern and western customers. All home-plant facilities are duplicated at the Huntington branch, including every phase of research, product control, and volume production. Angier welcomes any problem involving industrial rubber, latex and resin cements, pressure sensitive adhesives, paper coatings, laminates, etc. Because the company has not confined its interests and experience to the adhesive or coating problems of any one field in particular, Angier products can be found in use throughout the country today in the manufacture of handbags, synthetic suede, raincoats, shoes, automobiles, tabletops, and a host of other products. Heading the sales office at the new Western Division is John Kerr, a Huntington resident, Plant superintendent at the same site is Henry Klos.

Acushnet Process Promotes Young

Richard B. Young

Acushnet Process Co., New Bedford, Mass., has announced that Richard B. Young, former treasurer, has been elected vice-president of the company and general manager of the Rubber Division, positions formerly held by the late Thomas W. Casey. It was also announced that Mrs. Flora M. Stewart, formerly assistant treasurer of the company, has been elected treasurer, succeeding Mr. Young. In addition to his former duties as treasurer, Mr. Young had been serving as assistant to the director of sales. Following his graduation from the Massachusetts Institute of Technology, Mr. Young joined Acushnet as a trainee. Working for a considerable period of time in nearly all departments of the company, he became assistant to the factory manager of the Rubber Division, and then factory manager before moving into the Sales Department and his present positions. Mrs. Stewart assumes her new position with extensive experience. In length of service with the company, she is second only to the president. Upon graduation from business school, Mrs. Stewart began her career at Acushnet in 1911 when the company office was a small shed, and her first desk and chair were old packing crates. Progressing with the company, she has held the positon of office manager and assistant treasurer.

Dico to Produce Mechanicals

Dico Co., Des Moines, Iowa, manufacturer of industrial wheels, hand trucks and wheelbarrows, has announced the installation of new, modern rubber processing equipment for the manufacture of a general line of mechanical rubber goods. Dico recently purchased the molded rubber business and equipment of the Pangborn Co. of Ottumwa, Iowa, and has moved that equipment into a new plant addition, built to house the rubber manufacturing operation. The new plant will be equipped to mold-on rubber "retreads" for pressed-on lift truck rims and industrial wheels. Semi-pneumatic tires, solid rubber industrial and caster-type wheels, and molded-on rubber wheels will be manufactured, as well as a variety of industrial and mechanical molded rubber products.

Field Appointed Vice-President

John A. Field has been appointed vice-president of the Carbide and Carbon Chemicals Co., a division of the Union Carbide and Carbon Corp., New York, N. Y. In his new capacity, Mr. Field will be responsible for sales development and related activities, including the company's fellowships at Mellon Institute, in Pittsburgh. Mr. Field has just returned to the company after a six-month leave of absence to act as Assistant Administrator of the Business and Defense Services Administration, U. S. Department of Commerce. He joined Carbide in 1936 as a unit foreman in the production of miscellaneous new chemicals. From 1939 to 1940, he engaged in Research at Mellon Institute and came to the headquarters of the company in New York in 1941.

During World War II, Mr. Field was a department head in the production of butadiene from alcohol at the Institute, West Virginia plant. He later became manager of the production control section, Office of Rubber Reserve of the Reconstruction Finance Corp. After the war he rejoined Carbide as product manager in the Fine Chemicals Department, a position he held until he became assistant manager of the Fine Chemicals Department in 1952. He held this last position until he went to Washington in June, 1954. Mr. Field received his B.A. degree in chemistry from Yale University in 1935. After graduation he attended Oxford University on a Henry Fellowship. He is a member of the American Chemical Society, Commercial Chemical Development Association, American Institute of Chemical Engineers, Chemical Market Research Association, Society of Chemical Industry, The Chemists' Club, The University Club of Washington, and the Yale Club of New York.

Chosen ACS President-Elect

The American Chemical Society has chosen as president-elect Dr. John Christian Warner, president of the Carnegie Institute of Technology, who was a key figure in the World War II atomic energy program. He will head the society in 1956. The president for 1955 will be Professor Joel H. Hildebrand of the University of California who succeeds Professor Harry L. Fisher of the University of Southern California. A scientist, teacher and writer in physical chemistry, electrochemistry and metallurgy, Dr. Warner during the war directed and coordinated research on the purification of plutonium.

Improved Lead Advasol Drier

Advance Solvents & Chemical Corp., New York, N. Y., has announced the development of an improved lead tallate said to be superior to any lead tallate on the market. With a light color equal to the finest grades of lead naphthenate and a low viscosity also equal to lead naphthenate, "Advasol" lead also offers excellent cold stability, the company states. There is no precipitation with a minimum change in viscosity at temperatures as low as 0°F. Advasol lead is flowable at 0°F., so that outside storage during the winter months offers no problem.

Named Field Sales Manager

L. R. Modlin, Jr.

L. R. Modlin, Jr., has been named field sales manager of the General Chemical Sales Department of the B. F. Goodrich Chemical Co. Mr. Modlin, former staff representative, will be in direct charge of all general chemical field sales with each salesman reporting to him. The new field sales manager was graduated from Wake Forest College in 1937 with a B.S. in chemistry and he received his Ph.D. in organic chemistry from the University of Virginia in 1941. Mr. Modlin joined the B. F. Goodrich Co., in Akron in 1942, where he was engaged in synthetic rubber research until 1945, when he moved to Goodrich Chemical Co., in Cleveland, Ohio. With the chemical company he has held several research and development positions in both plastics and chemicals. Mr. Modlin is a member of the American Chemical Society, the Commercial Chemical Development Association, and the Chemists' Club of New York.

Rubber Technology Course

The Philadelphia Rubber Group, in cooperation with Villanova University, has announced a spring semester course in basic rubber technology. The scope of the course will include rubbers and compounding ingredients. Their usages and their functions will be covered as well as processing methods and problems, testing and testing procedures, and basic compounding methods. This course is aimed at the practical aspects of rubber technology and is designed to be of use to the factory compounder and technician, salesmen, purchasing agents, production supervisors and interested students. The 16 week course will be given on Monday evenings beginning February 7 at Villanova University, Villanova, Penna., with lecturers being drawn from industry. The cost of the course will be $30 per student. Two semester credit hours in chemical engineering at the graduate level will be available to those wishing to work in that direction and who meet the necessary requirements. Interested parties are requested to contact A. J. DiMaggio, Firestone Tire & Rubber Co., Pottstown, Penna., chairman of the Philadelphia Rubber Group, for additional information.

Thorobred Premium Tubeless Tire

Dayton Rubber Co., Dayton, Ohio, has introduced a new tubeless tire designed to meet the demands of the present changeover and replacement markets. The company states that its new "Thorobred Premium Tubeless Tire" represents the culmination of nearly 25 years of tubeless tire research by the company. Dayton Rubber first tested tubeless tires in 1930, Irve Eisbrouch, vice-president in charge of tire sales, pointed out. The early tire was designed to be vulcanized to metal and bolted to the rim. In 1940, the company experimented with another concept: a metal spring, when cabled into place, forced the tire beads against the rim. Although successful in many ways, this tire did not measure up to the company's standards of efficiency and safety and was discontinued. Dayton Rubber states that it was in a position in 1946 to manufacture tubeless tires. Introduction of the tire, however, was deemed impractical until automotive manufacturers changed over to tubeless tires as original equipment. While production was not started at that time, testing and research continued. The new tubeless tire incorporates a superior sealing ring design, the company states, and a special synthetic rubber compound inner liner to make it completely airtight. It is available in all popular sizes, both in black and white sidewall.

Karlton Machinery Corp. Formed

H. K. von Maltitz has announced the formation of the Karlton Machinery Corp., 210 East Ohio Street, Chicago 11, Ill., a sales and engineering organization specializing in hydraulic hot-plate presses, tapeless veneer splicers, precision veneer clippers, rotary wood slicing machines, and special machinery. Serving the rubber, plastics, wood and hardboard industries, Karlton Machinery Corp., is the U. S. representative of the firm of Becker & Van Huellen, Krefeld, Germany, Europe's largest builder of hydraulic presses exclusively. Karlton also represents Mueller Ltd., Brugg, Switzerland, for their cross-feed tapeless veneer splicer; as well as other Swiss and German machinery builders. Mr. von Maltitz formerly was connected with the Plycor Co.—of late years a division of the Earle Hart Woodworking Machine Co. He introduced the modern hot press process for making plywood into this country in the early 1930's. He also pioneered tapeless veneer splicing and continuous lumber core gluing in this country. The new Karlton Machinery Corp., has sales representatives throughout the country.

Virginia Rubber in Production

The new, $500,000 plant of the Virginia Rubber Co. at Iron Gate, Va., was to have started production on January 1, 1955. William Ryan, plant manager, reports that much of the machinery has been installed and heavy presses are being set up. A subsidiary of the H. O. Canfield Co. of Bridgeport, Conn., the plant will employ 300 to 500 persons when in full operation. At the outset, a group of 25 to 30 trainees will work at the new plant.

Chevalley Named to Technical Post

Louis D. P. Chevalley

Louis D. P. Chevalley has been named a technical manager at Plant 4 of The B. F. Goodrich Company Industrial Products Division, Akron, Ohio. Mr. Chevalley assumed technical responsibility for the following activities and products: calendering, sheeted tire repair and patching materials, rubber bands, pressure sealing zippers, latex thread and extruded goods. Mr. Chevalley, a native of Alton, Ill., attended Shurtleff College and was graduated from the University of Illinois in 1938 with a B.S. degree in chemical engineering. He joined Goodrich in Akron in 1939 in the chemical laboratory. In 1941 he moved to the Lathecut Goods Department and was then transferred to the Aeronautical Technical Group in 1942. In this division he did development work on airplane "De-Icers" and bullet-sealing fuel cells during the war years. After the war he was transfered to the rubber adhesives department. In 1947, Mr. Chevalley was assigned to the Plant 4 development group and later worked in the fields of extruded goods, plastics and inflatable goods, such as life boats and inflatable mattresses. In 1953, he was appointed section manager of compounding for Plant 4. Mr. Chevalley is a member of the American Chemical Society and its Rubber Division.

Announces Personnel Changes

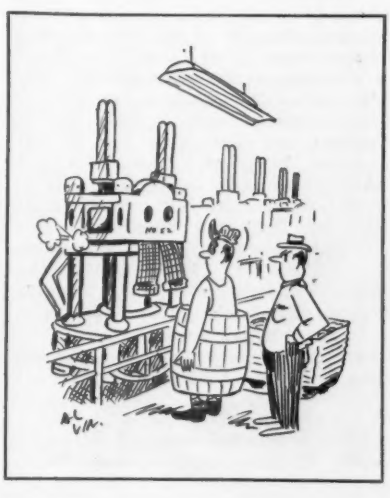
Several organizational changes in the Carbide and Carbon Chemicals Co., New York, N. Y., were recently announced by H. B. McClure, president. Dr. R. L. Bateman, formerly manager of the Fine Chemicals Division, has been appointed to the newly-created position of director of product development. In this new capacity, he will work with John A. Field, who was recently made vice-president in charge of sales development and related activities. W. A. Woodcock has been appointed manager of the Fine Chemicals Division succeeding Dr. Bateman. Dr. R. H. Wellman has been appointed manager of the Agricultural Chemicals Division. Both Mr. Woodman and Dr. Wellman will assist Dr. Bateman in developing markets for Carbide's newer products.

Firestone Tire Cord Unit

According to the Firestone Tire & Rubber Co., motorists will get safer, stronger and longer-wearing tires from new electronic tire cord tensioning and gum-dipping equipment just put into full-scale operation in Gastonia, N. C. The huge unit, as high as a five-story building and three times as long, gum dips the tire cord, stretches it and tempers it in one continuous electronically controlled operation. Specially designed and built by Firestone, it is said to be the first cord-treating factory of its kind in the world. The gum dipping process was introduced as an exclusive process by Firestone in 1920 when only cotton cords were used, officials state. The introduction of the synthetic fiber cords, rayon and nylon, presented a new problem because the cords expanded or "grew" when they became hot from fast driving. Engineers developed a way to take the stretch out of the synthetic cords by applying controlled tension at precise temperatures, thereby locking the cords and giving them a permanent "set", preventing tread cracking and ply separation. Until recently, these operations were performed by separate processes, a costly and time-consuming operation. The new unit now combines and performs these two operations in one continuous process making mass production possible and assuring uniform quality. The new process has been under development for several years and its exclusive features were designed by company engineers, according to Raymond C. Firestone, executive vice-president and in charge of development and engineering who stated that it is the first one in the rubber industry designed for the processing of both rayon and nylon.

Buys Eastern Insulated Wire

Herman B. Ring, president of the Circle F Manufacturing Co., Trenton, N. J., manufacturers of electrical wiring devices, has announced that his company has purchased the Eastern Insulated Wire Corp. of Wallingford, Conn. Mr. Ring said the 51-year-old Circle F company is now in a position to supply complete wiring and electrical devices for industrial and home appliance use.



Appointed to Sales Service

Donald S. Black

Donald S. Black has been appointed to the Sales Service Section in the Chemical Division of the Goodyear Tire & Rubber Co., Akron, Ohio. Mr. Black will handle expanding technical sales service on rubber reinforcing resins and the Chemigum rubbers. He has had considerable industrial experience in the ink and rubber industries. Since 1951 he has worked on the Goodyear production and staff squadrons in compound and process development work for the industrial products division. His work consisted primarily of devising operating specifications for mills, Banburys, and calenders. Much of his time has been devoted to factory service to customers of industrial hose. A chemical engineering graduate of Northeastern University, Mr. Black is a member of the Rubber Division of the American Chemical Society and the Akron Rubber Group.

Active Experimental Polymers

From time-to-time the Office of Synthetic Rubber of the Federal Facilities Corporation, Washington, D. C., publishes a listing of currently active experimental polymers. This latest list covers the period ended November 15, 1954. Since these are experimental polymers, their availability at the time of ordering should be ascertained by inquiring of the Sales Division, Office of Synthetic Rubber. The latest list contains no solid polymers and includes GR-S X-765 Latex and GR-S 767 Latex. The list also includes the following experimental polymers which have been assigned new numbers:

Old Numbers	*New Numbers*
GR-S X-617 Latex	GR-S 2101
GR-S X-667 Latex	GR-S 2102
GR-S X-710 Latex	GR-S 2103
GR-S X-711 Latex	GR-S 2104
GR-S X-758 Latex	GR-S 2105
GR-S X-760 Latex	GR-S 2106

Tucker Promoted by Goodrich

B. F. Goodrich Co., Akron, Ohio, has announced the appointment of Frank T. Tucker, who has been the company's director of advertising, as assistant to president W. S. Richardson. Mr. Tucker, a graduate of the University of Wisconsin, joined Goodrich in 1919 and became advertising director in 1940.

FINANCIAL NEWS

FIRESTONE NET IN FISCAL 1954 DECLINES FROM FIGURE IN 1953

Firestone Tire and Rubber Co. had a net income of $40,509,944 in the fiscal year ended on last October 31, compared with $46,748,971 earned in the preceding fiscal year. The respective earnings are equal to $10.04 and $11.77 a share. The drop in sales and income was attributed to lower production of cars, trucks and tractors, which reduced the demand for original equipment tires; cutbacks in defense production and a company-wide strike that began on August 13 and ended on September 7. Net sales were $916,047,040 compared with $1,029,402,035 a year before. The tax bill this year was $41,000,000 against $47,400,000 the year before.

Profits of foreign subsidiaries were $13,610,420, from which a reserve of $1,599,615 was provided for profits that could not be remitted during the year because of exchange shortages. Devaluation of foreign assets resulted in a charge of $2,629,453 to a reserve provided from income in prior years, according to the report.

Additions to and improvements of plants and equipment amounted to $43,693,495. The company completed this year a plant in Valencia, Venezuela, and began construction of a plant in Los Angeles, Calif., for the production of guided missiles and airplane fuel cells.

Natural rubber production on the Firestone plantations in Liberia reached a record 75,771,009 pounds, the greater part of which was shipped in the form of latex to manufacturers of foam rubber products.

Net working capital on October 31, last, was $300,703,549 compared with $293,337,497 a year earlier. Stockholders on January 15 will vote on increasing the authorized common stock to 12,000,000 shares of $6.25 par value from 7,000,000 shares of $12.50 par, paving the way for a two-for-one split.

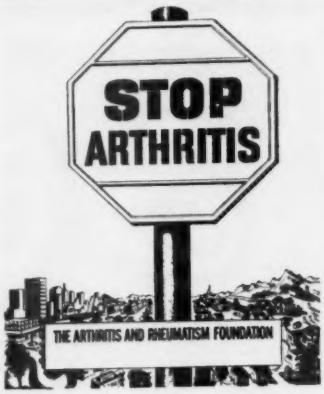
Harvey S. Firestone, Jr., chairman, and Lee R. Jackson, president, expressed optimism on the 1955 outlook. During the coming year, they estimated there will be 2,000,000 more cars and trucks in use than in 1954 and the number of vehicles requiring replacement tires will be the largest in history. It is also anticipated, they said, that the production of new cars, trucks, tractors and farm implements in 1955 will exceed that of 1954, creating an expanded market for original equipment tires. Sales of auto supplies, foam rubber, industrial rubber products, plastics, chemicals and other products are also expected to increase.

Boston Woven Hose and Rubber Co.

Quarter Ended November 30: Net income of $61,349, which is equal to 11c a common share, compared with a net loss of $93,910, or 34c a common share, in the same quarter of the preceding year. Net sales for the 1954 quarter amounted to $3,920,326, compared with $3,565,416 in the previous year.

Armstrong Rubber Co.

Year Ended September 30: Net income of $1,669,458, which is equal to $4.02 a common share, compared with $1,719,340, or $4.16 a common share, in the preceding year. Net sales amounted to $55,376,084, compared with $62,290,322 in the previous year.



To Produce Foam-Backed Fabrics

Collins & Aikman Corp., New York, N. Y., one of the nation's largest manufacturers of furniture and automobile upholstery, has entered a new field with the production of foam rubber-backed fabrics. Collins & Aikman will manufacture and distribute these fabrics under its "Candalon" trade name using the process developed by the Andrews-Alderfer Co. of Akron, Ohio, manufacturers of "Fabricushion". Collins & Aikman will produce all types of foam rubber-backed fabrics, in various widths, to meet the growing demand for their use in such fields as the shoe and cosmetic industries. The foam coating operation will be centered at the company's plant at Roxboro, N. C. A section of this plant was recently remodelled and special machinery installed for the production of the new products. In manufacture, the rubber is applied directly to the fabric in liquid form which is then solidified in a foam stage. This technique is said to make the pad an integral part of the fabric. Collins & Aikman is now equipped to handle the coating of any fabric, either its own or that made by another manufacturer, officials state.

German Data on Synthetics

The Research Information Service, 53 Nassau St., New York 38, N. Y., has announced that translations of research reports and patent applications of new German processes for producing synthetic elastomers and adapting them to various end uses are catalogued in Research Information Service Bulletin No. 92, entitled "Synthetic Rubber". The bulletin gives titles, abstracts and bibliographic data on more than two dozen translations. Divided into two main sections, production and properties, and compounding and processing, Bulletin 92 lists a wide variety of processes and auxiliaries, such as the following: "Process for Producing Rubberlike Polymers"; "Process for Producing Elastomers from Polyesters and Diisocyanates"; "Process for Manufacturing Foam Rubber", and "Antioxidants for Rubber and Synthetic Elastomers". Particulars on these and other reports are contained in Bulletin 92 which is available free of charge from the Research Information Service.

DeMaestri Elected Vice-President

Michigan Chemical Corp., Saint Louis, Mich., has announced the election of Fred A. DeMaestri as vice-president in charge of operations. Mr. DeMaestri formerly was technical supervisor of the Ehret Magnesia Manufacturing Corp., Valley Forge, Penna. A graduate of the University of Santa Clara with a B.S. degree in chemistry, he was associated with the Westvaco Chlorine Products Corp. from 1937 to 1941. In 1941, he joined the Kaiser Aluminum & Chemical Corp., leaving in 1944 to serve with the U. S. Navy. Following his service with the Navy, Mr. DeMaestri entered private business and consultation in chemical production methods. In 1948, he joined Ehret Magnesia Manufacturing Corp., where he worked in research, process development, and operations, in the manufacture of 85% magnesia block and pipe covering insulation.

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U.S. Chemical and Rubber Data

Publication of a new monthly industry report covering the chemical and rubber products industries has been announced by the Chemical and Rubber Division of the Business and Defense Services Administration, Washington, D. C. Publication started with the November, 1954, issue. The new periodical, called "Chemical and Rubber Industry Report", replaces two publications, "Chemicals and Drugs" and "Rubber", which were discontinued late in 1950 when major efforts were concentrated on the Korean emergency. The new report will show for the various chemical and rubber products statistical and economic analyses and basic data which will serve as tools for a better appraisal of business trends. Special articles also will be included. Annual subscription rate for the new publication is $1.75 for domestic and $2.25 for foreign subscribers. Single copies sell for 15c. Subscription requests should be addressed to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

To Lead Tire Yarn Section

Dr. Wayne A. Sisson has been appointed leader of the new Tire Yarn Section in the Research and Development Division of the American Viscose Corp. at Marcus Hook, Penna. The Tire Yarn Section will be responsible for research and development in all aspects of tire yarn and high tenacity yarn for industrial purposes. As the leader, Dr. Sisson will work closely with both production and sales. Dr. Sisson, previously head of the Cellulose Section which has been temporarily discontinued, will include cellulose research work within the structure of his new product section. Assisting him in an administrative capacity will be James B. Maginnis, who will also carry on his present work in tire yarn evaluation.

Dr. Sisson received a B.S. degree at Roanoke College, a Ph. D. from the University of Illinois, and was a Textile Foundation research fellow at the University of Illinois and the University of Leeds in England. Prior to joining American Viscose in 1940, he was an associate cotton technologist with the U. S. Department of Agriculture and a research chemist with the Boyce Thompson Institute. He is a member of numerous scientific and honorary groups including the American Chemical Society and the Fiber Society. Mr. Maginnis, a graduate of Duke University and Syracuse University with B.S. and M.S. degrees in physics, joined American Viscose in 1948 as a junior research physicist. He is a member of three scientific honorary fraternities, the Kappa Alpha Order, and the U. S. Naval Reserve.

New Instrument Recording Pen

A new instrument recording pen by the Bailey Meter Co., Cleveland, Ohio, is said to be saving operating dollars daily by speeding data interpretation and relieving skilled personnel of monotonous duties. This featherweight, stainless steel capillary pen is fed from a clear, hermetically-sealed, plastic ink sac containing over a year's supply. Capillary action maintains continuous flow to a precision ground point which traces a sharp, opaque, quick-drying record. "Poisoning" of intersecting records is practically eliminated, thus perfecting chart legibility. As many as four pens trace on parallel time arcs only forty-two thousandths of an inch apart, which simplifies record interpretation and analysis, the company states.

Firestone Splits Common Stock

Directors of the Firestone Tire & Rubber Co. voted on November 30 to split the company's common stock on a two-for-one basis, subject to approval by stockholders at the annual meeting held on January 15, 1955. At the January meeting, stockholders were to vote on amended articles of incorporation which would increase the authorized number of common shares from 7,000,000 to 12,000,000 shares, and reduce the par value of the stock from $12.50 to $6.25 a share. The board also announced that the quarterly dividend declared in December, 1954, for payment on January 20 to holders of record January 5, was to be increased from 75c to $1 a share, an amount equal to 50c a share after the stock is split.

Goodrich Promotes Keltner

Laurence R. Keltner

Laurence R. Keltner has been appointed manager of tire compounding for the B. F. Goodrich Co. Tire & Equipment Division. Mr. Keltner, a graduate of the University of Missouri, has filled many supervisory and executive positions in his 28 years of service with Goodrich. In the early part of his career he was an analytical chemist, research physicist and heat and curing engineer. He later served in the Compounding Division and during World War II handled many special assignments in the Technical Department. In 1947, he was transferred to the company's Los Angeles tire manufacturing plant as plant manager, where he remained until May, 1951, when he returned to Akron. He is a member of the American Chemical Society and the American Ordnance Association.

Harry E. Smith Retires

Harry E. Smith, vice-president in charge of rubber products sales for Raybestos-Manhattan, Inc., Passaic, N. J., and a member of its board of directors and Executive Committee, has announced his retirement after 45 years with the company. Mr. Smith advanced through the ranks in clerical, administrative and sales capacities, reaching the position of vice-president. He is also a director of the Rubber Manufacturers Association, Inc., being prominent on several committees, and has been a member of the Rubber Advisory Panel of the U. S. State Department. Mr. Smith has also been active in civic affairs, having just been president of the Passaic Chamber of Commerce. He is also a member of the board of governors of the Passaic General Hospital and past-president of the Upper Montclair Country Club.

Carver Plans Far Eastern Tour

Leslie D. Carver, export technical sales manager of the Witco Chemical Co. and the Continental Carbon Co., is planning an extended business trip through the Far East in 1955. Leaving New York in mid-February, Mr. Carver plans to visit Witco-Continental representatives and connections in Japan, the Philippines, Indonesia, Australia and New Zealand.

Federal Tire Recapping Plant

A plant which will provide tire recapping services for government establishments in the area—and on the whole Atlantic seaboard, if that is economically feasible—is under construction at the Federal Reformatory near Petersburg, Va. The facility, which officials said will be able to "recap anything that rolls", is scheduled for completion by June 1, 1955 at a cost of approximately $250,000. The new installation stems from the U. S. Army's plan to abandon its tire recapping plant at Red River Arsenal near Texarkana, Texas. It was stated that the new plant probably will be called on to fix tractor tires and airplane tires besides recapping regular automobile and truck tires. There is also the possibility that the plant will be utilized to patch GI boots and other pieces of rubber equipment used by the Armed Services. The plant will be run by inmates under the supervision of a civilian superintendent. The plant will employ 60 inmates and will have dimensions of 182 by 62 feet. The installation will not compete with private enterprise, officials state, since the government already furnishes tire recapping services for its own equipment. The plant is to be a part of Federal Prison Industries, Inc., which, it is said, is one of the few government agencies that "turns money back to the Federal government".

Connecticut Holds Fall Meeting

Approximately 135 members and guests of the Connecticut Rubber Group attended the Fall Meeting held on November 12 at Tiernan's Homestead in Swan Rock, Conn. The Fall Meeting was held in honor of the sales representatives affiliated with the group in acknowledgment of their support of the group during 1954. The main business of the meeting was an announcement of new officers for 1955. Members elected to office include: *Chairman*, W. E. Fisher (Armstrong Rubber); *Vice-Chairman*, James R. Boyle (Armstrong Rubber); *Secretary*, Warren Hess (U. S. Rubber); *Treasurer*, Harry Gordon (Bond Rubber). The following members were elected to the board of directors: B. M. Fairbanks (G-E), Otto Lang (K. B. C. Industries), E. J. Butler (G-E), Lyle Longworth (Monsanto Chemical), and G. A. DiNorscia (Sponge Rubber Products). The business meeting was followed by a paper by S. Braley, development engineer of the Dow Corning Corp. Mr. Braley spoke on "Compounding of Dow Corning 400 and 410 Silicone Gums." The paper was followed by a short question and answer period.

Tubeless Wheelbarrow Tires

What are said to be the first tubeless industrial tires to be built for wheelbarrows and other small vehicles are being produced by the Goodyear Tire & Rubber Co., Akron, Ohio. The new tires are being manufactured in two and four ply size (4.80—4.00 x 8) and are constructed in a manner similar to the company's line of tubeless passenger tires. The new tires are priced at the same levels as a tire and tube combination.

Firestone Retreading System

Development of a completely new method of applying new treads to worn truck tires, which is said to result in tailoring the tread to the contour of each worn tire, has been announced by the Firestone Tire & Rubber Co. The individualized retreading system, known as the "Dimension Contour Method", now is being used by all Firestone retread shops and is available to truck owners in all sections of the country. Because tire sizes sometimes vary, due to the difference in manufacturing methods, and because of uneven growth of the tire during use, variable wear and other causes, tire engineers evolved a system of precise measurements for tires to be retreaded. This enables exact patterns to be set up for buffing the old tire and the application of proper-sized stock for curing into a perfectly proportioned tire. This careful procedure followed by Firestone retread shops means that there will be no distortion in the retreaded tire because of out-of-proportion tread stock. Such distortion often leads to imperfect curing, thin spots in the tread and buckled tire bodies. Any of these defects can result in premature failure of the retreaded tire. Under the Firestone method, the old tire is exactly buffed and the new material perfectly fits the old tire as to tread width and depth. The company states that all danger of heretofore common defects is eliminated and the retreaded tire has the appearance of a new one.

Elected Secretary of DuPont

Pierre S. du Pont, III, has been elected secretary of E. I. du Pont de Nemours & Co., Inc., succeeding Lammot du Pont Copeland, who was recently elected a vice-president and designated chairman of the Finance Committee. Mr. du Pont joined the company in 1934. He has been a director since 1948 and has been assistant director of sales of the Rubber Chemicals Division, Organic Chemicals Department, since 1951. A graduate of the Massachusetts Institute of Technology with a B. S. degree in 1933, Mr. du Pont is the son of the late Lammot du Pont, former president and chairman of the board of the company, and is a great-great grandson of E. I. du Pont de Nemours, who founded the company in 1902.

Develops New Rubber Compound

Development of a new rubber compound for sealing such high vacuum applications as electronic devices, lens coating machinery, evaporators, high vacuum distillation, electron microscopes and special testing devices has been announced by the Minnesota Rubber and Gasket Co., Minneapolis, Minn. Designated "366YV", the compound is a special formula of Buna N which can be injection molded into special shapes as well as standard sizes of Quad-rings and O-rings, the company states. Chief advantages of the new rubber compound are its high resistance to out-gassing at high temperatures and long service life in permanent installations, Minnesota Rubber claims.

LABOR NOTES

Local 399 of the United Rubber Workers, C.I.O., called off its strike against the Johnson Rubber Co. of Middlefield, Ohio, on December 15, 1954. The walkout had started last July 30 when contract negotiations broke down. During the strike, the company said, 160 new employees were hired to replace strikers. Also, according to the company, 140 union members returned to work during the strike. Now pending before the National Labor Relations Board are charges by the union against the company claiming unfair labor practices. The company has filed with NLRB for an election among employees to decide whether the union shall be the bargaining agent. The company and union do not have a contract at the present time.

Local 7 of the U.R.W. and the Firestone Tire & Rubber Co. signed a supplemental contract on December 8 ending the threat of a strike by 9,000 employees at Akron, Ohio. The signing of the contract ended about two months of bargaining and provided for: (1) A "greatly improved" seniority system; (2) Intraplant wage differential adjustments for "several hundred" employees; (3) Adjustments on normal earning rates for employees in the mechanical building, steel products and Plant 3, and (4) The company to issue protective clothing on "abnormally" hazardous jobs.

Agreement was reached on December 4 on a contract for 3,300 employees at the Firestone plant in Memphis, Tenn. The agreement calls for the major issue—how long it takes an employee to make a tubeless tire—to be submitted to arbitration. The complex issue involved only 135 of the strikers. Since the employees are paid by the piece, the time rate has a great deal to do with pay. The company argued that the time rate should be 3.277 minutes. The union said 2.842 minutes.

Adjusts Rubber Flooring Prices

Price adjustments upward, averaging four per cent on all rubber flooring lines, have been announced by the Flooring Division of the Goodyear Tire and Rubber Co., Akron, Ohio. The new price schedule was made effective to Goodyear flooring distributors December 1. In making the announcement, H. M. Evans, manager of flooring sales for Goodyear, pointed out that the revised price schedule was made necessary by the increased costs of raw materials and labor. The current price structure of Goodyear's .080 residential and H. D. H. All-Vinyl flooring lines is not affected by the price adjustment.

Joins American Resinous

American Resinous Chemicals Corp., Peabody, Mass., has announced the appointment of James H. Christopher, Jr., as technical representative in New England as of December 1, 1954. Mr. Christopher was graduated from Brown University in 1935 with a B. S. degree in chemistry. He was formerly connected with the Titanium Pigment Corp. and Dee's Adhesives & Chemicals.

Guiberson Expands Plant

Guiberson Corp., Dallas, Texas, has announced completion and occupancy of a new rubber plant addition which more than doubles the former working area. The original building was remodeled and integrated with the new addition to form a unitized plant, completely modern in every respect. An air conditioned laboratory allows extremely accurate checking of physical properties in the numerous natural rubber and synthetic rubber compounds developed by Guiberson for oil field use. The fully equipped laboratory facilitates a program of constant research and development, coupled with rigid quality control of regular production, carried on by Guiberson chemists who are specialists in compounding oil field rubber products. For many years Guiberson has compounded and molded all rubber elements used in Guiberson products and recently offered other manufacturers the benefit of their experience and facilities on a custom basis. Wide-spread acceptance of this service plus steadily increasing demand for Guiberson products made the expansion mandatory, according to the company. Complete custom service from mold design to finished product is now possible. Precision production of molds, various metal and fabric reinforcing elements peculiar to the oil business are now offered by Guiberson.

Opens New Research Structure

A new ultra-modern structure housing the basic and applied research laboratories of the Paint and Brush Division of the Pittsburgh Plate Glass Co., was officially opened at Springdale, Penna., on December 10. The main research building and pilot plant is a three-story concrete structure with brick facing. Containing approximately 68,000 square feet of floor space, the laboratory is completely air conditioned. Headed by Dr. Howard Gerhart, the research laboratory currently has a staff of 85 chemists, engineers and assistants. Many of the chemists at the new Springdale laboratories are specialists in the creation of new high polymers. One wing of the building is reserved for teams of specialists in high polymer chemistry whose function is to synthesize new chemical compounds for synthetic resins. Another major portion of the laboratory is devoted to the formulation, application and evaluation of new polymers. The coatings research group also studies the fundamental properties of coatings and the causes and prevention of paint deterioration.

Names Technical Representative

Claremont Pigment Dispersion Corp., Brooklyn, N. Y., has announced the appointment of William W. Krause as technical representative covering the New England area. Mr. Krause was formerly with the Smith Chemical and Color Co. Murray Marlowe and Mark W. Neitlich, the previous technical representatives in this area, will now concentrate in the Southern Connecticut-Metropolitan New York, and the Middle Atlantic areas, respectively.

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Goodrich Chemical Names Three

R. F. Dettelbach has been named field sales manager for plastic materials; W. E. Manring, sales development manager; and C. D. Segner, plasticizer materials manager of B. F. Goodrich Chemical Co., Cleveland, Ohio. Mr. Dettelbach, former eastern sales manager with offices in New York City, will move to the Cleveland headquarters office. Mr. Dettelbach will be in direct charge of all field-sales with each salesman reporting to him. The new manager joined the B. F. Goodrich Co. in 1944 as a technical service engineer. He was transferred to the chemical company in 1945, and was made a sales representative in the New York area. In 1952, he was appointed eastern sales manager for plastic materials. Mr. Dettelbach was graduated from Valparaiso University in 1931 with a B.S. in chemistry, and worked for Utica Hydraulic Cement Co. and Stewart-Warner before joining Goodrich. He is a member of the Society of the Plastics Industry and the Chemists' Club of New York.

Mr. Manring will direct market development work for new plastics and applications. He was graduated from Wesleyan University, Middletown, Conn., in 1937, with a B.A. in chemistry. He joined Goodrich Chemical in 1948 as a technical service engineer at Avon Lake, Ohio, after working for American Cyanamid for 11 years in both technical and sales capacities. Mr. Manring held various other positions with the chemical company until early 1954 when he was named technical service manager, the job he has held until now. He is a member of the Society of the Plastics Industry, Society of Plastics Engineers and the American Chemical Society.

Mr. Segner, in his new job as plasticizer materials manager, will head sales for plasticizers used in the manufacture of plastics. He is a graduate of the University of Illinois with a B.S. in chemical engineering. He joined Goodrich in 1937 as a chemist in the general laboratories in Akron, and in 1939 he became a member of the research group on polyvinyl chloride plastic. Mr. Segner had several other positions in research and sales both with the parent company in Akron and with Goodrich Chemical before becoming technical staff representative in 1951. Mr. Segner belongs to the Society of the Plastics Industry, Society of Plastics Engineers and the American Chemical Society.

Vaccaro Elected Vice-President

Michael D. Vaccaro has been elected vice-president in charge of Eastern Sales for the Witco Chemical Co., New York, N. Y. Mr. Vaccaro was made eastern sales manager in October, 1953. For 16 years he has been active in Witco's eastern sales organization, covering Pennsylvania, New Jersey and Metropolitan New York. Mr. Vaccaro first entered Witco's employ in 1937 and is former councilman of his home town of River Edge, N. J. He is a member of the Chemist's Club, American Chemical Society, New York Rubber Group, Philadelphia Ink Production Club, Philadelphia Rubber Group, and the American Chemical Industry Salesmen's Association.

Greeff Named Stanolind Agent

Stanolind Oil and Gas Co., Tulsa, Okla., has announced that it has signed an exclusive contract with R. W. Greeff & Co., Inc., New York, N. Y., for marketing the production of chemicals from Stanolind's chemical plant at Brownsville, Texas which is expected to begin operations in the fall of 1955. The agreement covers all of the water-soluble chemicals — acids, alcohols, aldehydes and ketones—that will be produced at Brownsville. Design capacity of the Brownsville plant is approximately 125,000,000 pounds of chemicals per year. The chemicals to be produced at Brownsville originate as by-products of the hydrocarbon synthesis process employed in the Carthage Hydrocol, Inc., gas synthesis plant at Brownsville. The water-soluble chemical stream is piped to Stanolind's adjoining chemical recovery plant, where the chemicals are separated and refined. The water-soluble chemicals to be produced at Brownsville include methanol, ethanol, n-propanol, iso-propanol, n-butanol, iso-butanol, pentanol, acetaldehyde, propionaldehyde, acetone, methyl ethyl ketone, methyl n-propyl ketone, methyl n-butyl ketone, acetic acid and propionic acid.

Appoints New Division Manager

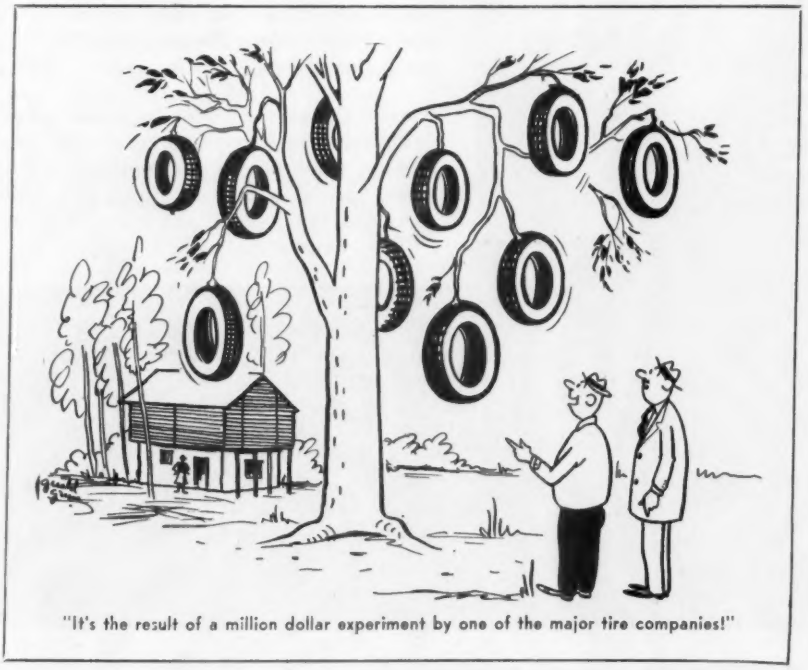
E. W. South, vice-president in charge of sales for the Hamilton Rubber Manufacturing Corp., Trenton, N. J., has announced the appointment of Andrew S. Kaminski, Jr., as division manager of its Chicago, Ill., branch. Mr. Kaminski joined the Hamilton sales organization in 1947, serving in both office and field capacities. A native of Chicago, Mr. Kaminski is a graduate of St. Louis University and served in the U. S. Navy from 1942-47. Mr. Kaminski is affiliated with the Illinois Mining Institute, Grain Elevator and Processing Superintendents and the Lake Shore Club of Chicago.

Hardesty Merger Announced

Wallace & Tiernan, Inc., Belleville, N. J., has announced that effective January 1, 1955 all operations carried on by W. C. Hardesty Co., Inc., will be conducted by the Harchem Division, Wallace & Tiernan, Inc. The change is being made to effect certain operating economies. It will in no way change the Hardesty activities in the fatty acid and plasticizer fields, since W. C. Hardesty Co., Inc. is a wholly-owned Wallace & Tiernan subsidiary. W. C. Hardesty Co., Inc., was originally acquired by Wallace & Tiernan in 1951. At that time, Hardesty had a partly owned subsidiary, Hardesty Chemical Co. Subsequently, Hardesty Chemical Co., was wholly acquired and merged into W. C. Hardesty Co., Inc. to become the Hardesty Chemical Division. The merger of these two operating units into the Harchem Division is simply a further step in the announced Wallace & Tiernan policy to expand and integrate its activities. The main plant of Hardesty is at Dover, Ohio and a second plant is operated in Toronto, Canada by a subsidiary, W. C. Hardesty Co. of Canada, Ltd. General offices are at Belleville, N. J. No personnel changes are contemplated and the new Harchem Division will continue to serve the many customers of W. C. Hardesty Co., Inc. with quality fatty acid and plasticizer products under the "Harchem" and "Century" brand names.

Self-Sticking Vinyl Covering

Harte & Co., Inc., New York, N. Y., has developed a self-sticking vinyl covering which is expected to find wide application in the do-it-yourself field. Called "Hartex", the material is made of Harte "Wataseal" vinyl sheeting with an adhesive backing. It can be affixed to many types of surfaces, such as wood, tile, etc., without the application of any additional adhesive.



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Take raw neoprene

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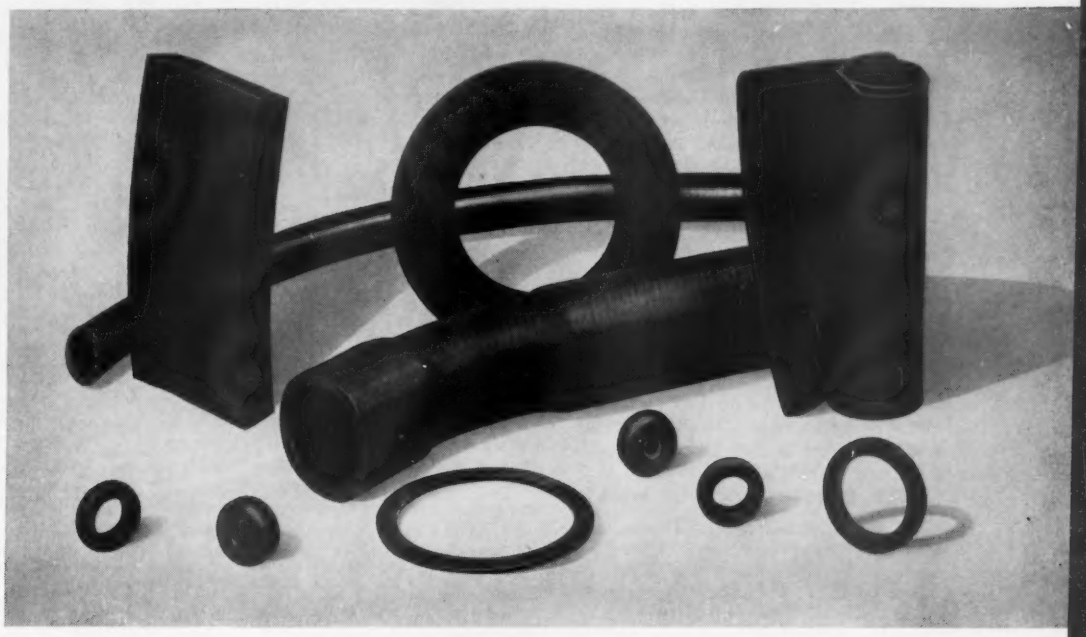
...plus curing agents

...and you can make all sorts of low cost neoprene products.



SUNDEX-53 HELPS MAKE POSSIBLE LOW COST EXTENDED NEOPRENES

If you would like to market oil-resistant neoprenes even in the face of strong price competition, consider this fact: Highly extended Neoprene WHV with SUNDEX-53 can be made for prices comparable with those of non-oil-resistant elastomers.

SUNDEX-53 is a low cost petroleum base oil which is highly compatible with neoprene in extended compounds. Used with Neoprene WHV stocks containing high loadings of fillers, SUNDEX-53 conditions these compounds to permit easy handling during processing. The resulting compounds extrude and calender easily and hold their shape through processing operations. Now, neoprene compounds extended with SUNDEX-53 can be used in the manufacture of automobile radiator hose, heater hose, windshield seals, sponge cushions, industrial air hose, washing machine hose, sheet packing, gaskets, grommets, and many other molded goods where cost is a strong factor, and where degradation by oil, grease, ozone, heat, and sunlight cannot be tolerated.

Get complete information on SUNDEX-53 from your Sun Oil representative. Or write Dept. RA-1.

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Becomes ASTM Staff Member

Frank Y. Speight has joined the staff of the American Society for Testing Materials as assistant technical secretary. He will be located at ASTM headquarters, 1916 Race Street, Philadelphia 3, Penna. For the past eight years, he has been on the staff of the National Academy of Sciences, National Research Council, Advisory Board on Quartermaster Research and Development as assistant to the executive director. Previously, he was engaged in plastics development with the American Cyanamid Co. His duties with the ASTM will be technical and editorial in nature. Among his early assignments are the staff contacts with Committees D-9 on Electrical Insulating Materials and D-20 on Plastics. A native of Georgia, Mr. Speight attended Georgia Institute of Technology but received his degree of B. S. in chemical engineering from Alabama Polytechnic Institute in 1938. He later took courses in the Yale University Extension School and in George Washington University. The ASTM staff now numbers 70. During the year the headquarters facilities were expanded by the purchase and the modernization of another adjoining building which houses the accounting, order, and shipping departments.

ASTM Schedules Committee Week

The American Society for Testing Materials will hold its annual Committee Week January 31 to February 4 at Cincinnati, Ohio. Headquarters for the meeting will be at the Netherlands Plaza Hotel; and arrangements have been made with the Terrace Plaza, the Sheraton Gibson, and the Sinton Hotels for additional rooms to accommodate the large number of members, committee members and visitors. It is expected about 1250 will attend. About 30 of the Society's 75 committees have indicated their intentions of meeting during Committee Week. There will be a total of about 300 committee and subcommittee meetings spread over the five-day period. Among the main technical committees scheduled to hold meetings is D-11 on Rubber and Rubberlike Materials.

Low Cost Aromatic Masks

A new group of inexpensive aromatic masks and perfumes has been developed by Standard Aromatics, Inc., 88 University Place, New York 3, N. Y. The series, known as the "Maskaromes," comprises a wide range of odor characteristics, including pine, rose, lilac, and others, finding use in the rubber, plastics, paper, textile, petroleum and other industries. The company states that products in a lower price range are made possible by a systematic and successful search for new industrial chemicals, hitherto unused by the aromatics industry, but which have excellent odor value and strength.

Keaton Rubber Moves Plant

Keaton Rubber Co., formerly located at 425 Adams Street, Newark 5, N. J., has moved to a new and larger plant at Belleville Turnpike, Kearny, N. J. The new telephone number is KEarny 2-3000.

Joins Wyandotte Chemicals

Dr. Lucas P. Kyrides has been appointed staff consultant in organic chemistry to the Research and Development Division of the Wyandotte Chemicals Corp., Wyandotte, Mich. Prior to joining Wyandotte, Dr. Kyrides was president and director of research of the Sumner Chemical Co. He has also served as research director of the Organic Division of the Monstanto Chemical Co. In 1944, Dr. Kyrides received the Midwest Award for his contribution to the advancement of chemistry. His past research activities include pioneering work in the development of synthetic rubber in the United States as well as significant contributions to the development of sulfa drugs, synthetic detergents, plasticizers and other industrial chemicals.

Israeli Firm Announces Expansion

Alliance Tire & Rubber Co., Ltd. of Hadera, Israel, has completed a $250,000 addition to its present $3,500,000 plant with a resulting 50% increase in production capacity. Arthur Taubman, president, said the step up in production will enable the firm to meet an increased domestic and overseas demand for tires. The present plant on the outskirts of Hadera has been enlarged and new machinery installed. It was pointed out that the overseas tire firm had been in existance less than three years. Alliance, the largest tire plant in Israel and the largest in the Middle East, was designed and equipped by engineers of the Dayton Rubber Co. Fifty percent of Alliance stock is held by over 500 American stockholders and the other half is held by Solel Boneh, Ltd., and Noa, Ltd. of Israel.

Describes Available Patents

A new book prepared by the Government Patents Board and published under the joint sponsorship of the U. S. Department of Commerce and the Small Business Administration includes 308 abstracts of government owned patented inventions relating to rubber, ceramic, paper, textile, wood and other products and processes. It also offers a list of government agencies which administer the patents, issue royalty-free licenses under them and provide information on the availability and use of the invention. The book, "Ceramic, Paper, Rubber, Textile, Wood and Other Products and Processes", is available for $1.00 from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

IRI Transactions Available

It has been brought to our attention by an English subscriber that he has almost a complete set of "IRI Transactions" available for sale at a reasonable price. Interested parties are requested to address the Editor, RUBBER AGE, 250 West 57th St., New York 19, N. Y., and these letters will be forwarded to England.

Licensing Elastomer Process

Girdler Co., Louisville, Ky., has become the exclusive licensing agent for the Elastomer process in all foreign countries except Canada. Announcement of the licensing arrangement was made jointly by John E. Slaughter, Jr., vice-president in charge of Girdler's Votator Division, and Henry E. Allen, vice-president of the Elastomer Chemical Corp., Newark, N. J., which owns the Elastomer process and the trade mark "Elastofoam." The Girdler Co. is a division of the National Cylinder Gas Co., Chicago, Ill. The Elastomer Process employs inert gas, instead of a chemically active foaming agent, in the production of foam vinyl from resin-based plastisols. Foam vinyl, made with this new process, has many desirable qualities not possessed by foam and sponge rubber, and is expected to compete with these products on a price basis. Girdler's processing apparatus and engineering services will be available to foreign licensees of the Elastomer process.

Technical Staff Appointments

National Polychemicals, Inc., Wilmington, Mass., has announced two additions to its technical staff at its Wilmington plant and laboratory. I. Torrence Gurman has been assigned to the chemical engineering group, and Walter P. Hwozdek has joined the research and development staff. Mr. Gurman, a graduate of McGill University, was formerly a design engineer with the Monsanto Chemical Co. Previously, he had been associated with the Kaysam Corp. of America, Arlington Rubber Co., Raymond Manufacturing Co., and Riordan Pulp Corp. Mr. Hwozdek was graduated from the Polytechnic Institute of Brooklyn and was previously associated with the Air Reduction Chemical Co. He has also been associated with the Ethicon Suture Laboratories, Inc., and Merck & Co. Mr. Hwozdek is a member of the American Chemical Society.

Pre-Matched Pastes Available

Standard pre-matched pastes in the "D-1000" series are currently being supplied to molders of vinyl plastic footwear by the Clarement Pigment Dispersion Corp., Brooklyn, N. Y. Among the colors popular are boot reds, browns, tans and whites. Production runs utilizing these products in plastisol formulations have proven them stable to curing temperatures ranging from 350°F. to 600°F. Colors perform satisfactorily in foam compounds under similar conditions. Pastes are smoothly and easily incorporated into plastisols by conventional methods during or after compounding, the firm states. Stocks of these materials are maintained at Claremont's Brooklyn warehouse for immediate shipment to its customers in the footwear field.

Plastisol coatings, based on Bakelite vinyl dispersion resins, are being applied to air-spray bottles by the Wheaton Plastics Co., Mays Landing, N. J., to prevent fragments from scattering if the bottles are dropped.

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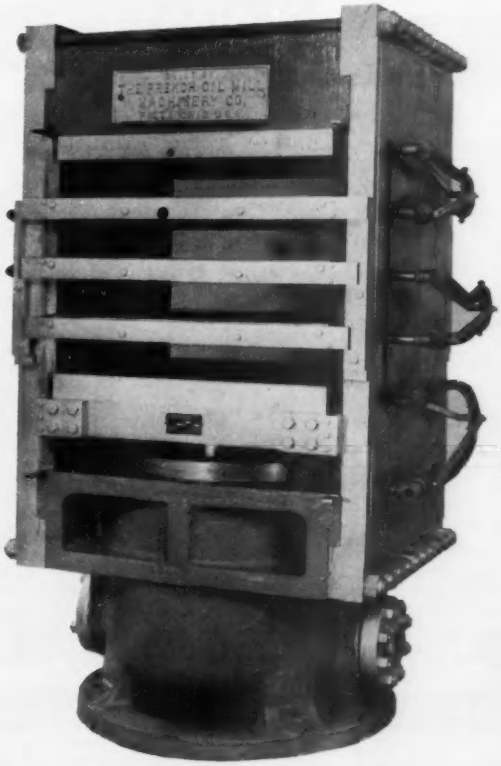

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Royal Master Tubeless Tire

Nylon and a new kind of liquid rubber are combined in a new "Royal Master" tubeless tire introduced by the U. S. Rubber Co., New York, N. Y., to give motorists protection at sustained high speeds, a silent ride and scuff-proof white sidewalls. Added to the advantages of this premium tire, according to company officials, is a gain of 22% in mileage. The new tire is specifically designed to meet the demands for safety and riding quality in modern automobiles with their stepped-up horsepower, acceleration and braking power, according to Howard N. Hawkes, vice-president and general manager of the company's Tire Division. "Outstanding features," Mr. Hawkes states, "are modern styling to blend with car designs, improved materials such as new carbon black and specially treated nylon cord, an exclusive tread for braking power and anti-skid protection, and added strength throughout. More than 3,000 tiny blocks in the tread give traction and stopping power on slippery road surfaces. These blocks wipe away road film so that the tread grips on dry pavement." The new tire has smooth shoulders and clean lines to complement new car styling. Sidewalls are recessed and protected, an exclusive feature in the industry. A test car was driven tight up against a curb for more than a mile without marking the white sidewalls.

With a special process, U. S. Rubber controls the stretch of nylon without any loss of strength or shock-absorbing ability. The cord is treated with a new liquid rubber latex to give an exceptionally strong bond between the cord and carcass. Two extra layers of cord beneath the tread weld the carcass and tread together, stabilize the tread against high speed distortion, and add to carcass strength and rupture resistance. An extra rubber strip has been added at the tire bead; and under severe cornering tests, the tire could not be pulled away from the rim to break the air seal. The special rib design of the tread minimizes squeal and hum and accounts for the greater mileage. All of the grooves are dog-leg in shape to throw out annoying pebbles. In grueling tests at the company's Lancaster, Calif., proving grounds, the new tire was driven at 95 miles per hour for long periods without a blowout or tire failure. This, Mr. Hawkes says, demonstrates the kind of protection motorists can expect driving at safe highway speeds.

Arno Building New Plant

Arno Adhesive Tapes, Inc., Michigan City, Ind., a subsidiary of Scholl Manufacturing Co., Inc., has broken ground for a new $1,100,000 plant east of Michigan City. The plant will have 163,200 square feet of floor space and will be located on a 75-acre tract. More than $260,000 worth of new equipment will be installed on completion, scheduled for July, 1955. Arno manufactures adhesive plasters for the foot remedies and arch supports made by the parent company; hospital and surgical tape, and special tapes for the armed forces. The new plant will triple existing Arno facilities.

LOS ANGELES NEWS

The Los Angeles Rubber Group recently announced the results of an election of officers for 1955. Members elected to office include: *Chairman,* F. C. Johnston (Caram Mfg.); *Associate Chairman,* Carl Hoglund (R. D. Abbott); *Vice-Chairman,* R. N. Phelan (Atlas Sponge Rubber); *Secretary,* Charles Kuhn (Master Processing); *Treasurer,* A. H. Federico (C. P. Hall).

The following members were elected as directors of the group for 1955: L. E. Budnick (Ohio Rubber), Ray E. Bitter (Goodrich Chemical), C. E. Wilson (Pacific Moulded Products), and W. M. Fairclough (Naugatuck Chemical).

Golden State Rubber & Latex Corp., Gardena, Calif., was substantially destroyed by a fire in the latter part of December. The extent of damage to machinery and equipment has not yet been determined. Douglas Chalmers, president, states that the plant will be back in production in sixty to ninety days.

C. Miles Reinke, sole owner of Reinke & Amende Co., has sold the concern to the Wilbur-Ellis Co. Mr. Reinke will remain with the company as president. He was chairman of the Los Angeles Rubber Group in 1946.

Herman Libkind, formerly associated with the Western Insulated Wire Co., has joined North American Aviation, Inc., as a plant engineer.

For the convenience of its West Coast customers in the Los Angeles area, the Ohio-Apex Division of the Food Machinery & Chemical Corp. has opened a sales office at 2716 North Broadway, Los Angeles, Calif. Glenn A. Farno, formerly associated with the Westvaco Chemical Division, has been placed in charge of the new office. Warehouse stocks of Ohio-Apex products are maintained locally.

Robert H. Neale has been named plant manager at the Maywood, Calif., plant of the Ideal Roller & Mfg. Co.

W. O. Riley has been appointed plant superintendent of the Anaconda Wire & Cable Co. plant at Orange, Calif.

To Offer New Processes

The Chemical Plants Division of the Blaw-Knox Co., Pittsburgh, Penna., has been licensed to offer two related reforming processes developed by the Hercules Powder Co., Wilmington, Del. The two processes—a method for producing hydrogen, and the olefins process—have a potentially wide and growing application, it was said. Both processes utilize alloy tubes set vertically in furnaces of similar design operating at high temperatures. The olefins process converts gaseous or liquid petroleum materials to a mixture of ethylene, propylene, and other products of upgraded value.

General Tire Makes Stock Bid

General Tire & Rubber Co., Akron, Ohio, has offered stockholders of the Motor Products Corp., Detroit, Mich., one share of General Tire's 5½% cumulative preference stock in exchange for four and one-half shares of Motor Products common. In a letter to stockholders, William O'Neil, president of General Tire said: "On the basis of $100 par value of the 5½% cumulative preference stock, this offer is equivalent to approximately $23.53 per share of common stock of Motor Products. Also, the 5½% preferred dividend would yield approximately $1.29 per year on each share of Motor Products Corp. stock exchanged." The closing date of the offer was set as January 5, 1955, and General Tire reserved the right to withdraw the exchange offer unless at least 315,000 shares of Motor Products common were tendered. Motor Products manufactures parts and accessories for automobiles and home appliances such as refrigerators. Meanwhile, it has been reported that union employees of Motor Products—with some backstage help from management—have started a fight to prevent General Tire from winning control. Members of Local 203, C.I.O., have been buying Motor Products stock on the New York Stock Exchange in an attempt to obtain enough stock so that together with management, General Tire will not be able to secure a controlling interest in Motor Products. Union officials stated that members of the local are afraid of what might be in store for the company if General Tire takes over. General Tire has given no indication of its plans for Motor Products.

To Market Para-Lift Conveyor

New York Belting & Packing Co., Passaic, N. J., will market a new package conveyor belt with a non-skid surface that will carry packages up grades as steep as 45°. Called "Para-Lift," the new belt has approximately 960 rubber cleats to every square foot of surface. Small grippers on the cleats hold packages firmly as they are carried up or down at sharp angles. The cleats will not tear loose because the belt is of molded construction. Water will run off easily when the belt is used outdoors on rainy days, and the flexing of the belt over the pulleys causes dirt and other foreign materials to be ejected. The Para-Lift is intended for use in the receiving, shipping and warehousing departments of most industries, as well as in department stores, super markets, airports, etc. It comes in widths up to 48 inches.

Griptex Non-Skid Rug Coating

Adhesive Products Corp., New York, N. Y., has announced the development of an improved non-skid rug coating called "Griptex Rug Life-Guard." Griptex is a liquid rubber cement coating that is easily applied by brush to the backs of rugs to make them permanently skid-proof. It is said to adhere to the rug even after washing and dry cleaning. Griptex Rug Life-Guard is being retailed in pints and quarts throughout the country.

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Mildew-proofing *and* Flame-proofing Cotton Fabrics as per Government Specifications. *Write or Wire for Samples and Quotations.*

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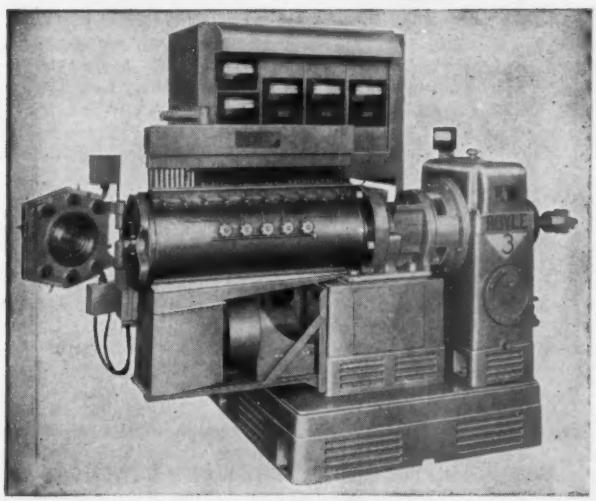

Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

- **Extra heavy walled cast steel cylinders that will not warp. No joints to leak when pressures are high or crevices to collect burned compound that would cause contamination.**
- **Heavy duty large diameter heating elements, that can be used with 440 volts without step-down transformers, provide radiant heat to cylinders and heads.**
- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
- **A cooling system with ten times the capacity of conventional designs can be modulated through its entire temperature range without drastic changes. Ample cooling for all compounds at maximum speeds.**

No. 3 Royle Spirod Extruder. Completely insulated and equipped for evaporative cooling.

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CANADIAN NEWS

Attorneys for the Firestone Tire & Rubber Co. of Canada, Ltd., B. F. Goodrich Rubber Co. of Canada, Ltd., and the Goodyear Tire & Rubber Co. of Canada, Ltd., have decided to appeal a recent ruling by the Canadian Tariff Board that retail corporations selling special brand tires or other goods are not manufacturers and are exempt from excise and sales taxes on their selling prices. The appeal will be made to the Exchequer Court in order to obtain a "conclusive interpretation of the definition of manufacturer" contained in the Excise Tax Act.

Goodyear, Goodrich and Firestone maintain that such retail outlets as the T. Eaton Co., Ltd., Simpson-Sears, Imperial Oil and the Canadian Tire Corp. are really manufacturers since they have tires containing their special brand mark produced for them.

The 10% sales tax and the 15% excise tax are levied on the manufacturers' selling price. If the Tariff Board had agreed with the contentions of Goodyear, Goodrich and Firestone, it might have led to a price increase in special brand tires since the tax costs would have been advanced. The special brand companies now pay the tax on their buying price.

Referring to the T. Eaton Co. which sells "Bulldog" and "Trojan" special brand tires, Goodyear and associates argued that Eaton is a manufacturer since it claims certain sales and proprietary rights in advertising the tires.

The Tariff Board, however, held that Eaton merely buys its tires from the true manufacturer, Dominion Rubber Co., Ltd., and that claims made in advertising should not be considered as legal argument in the tax case. The board ruled that the T. Eaton Co. is not the producer or manufacturer of the special brand tires and is not liable for tax on sales of such tires.

The three tire companies appealing the decision claim that the tax policy in special brand tires hinders competition by favoring mass retailing organizations at the expense of the small businessman engaged in the automotive field. The companies say they do not want any increases in taxes but rather a clarification of tax policy which will insure equitable distribution of the tax load.

Northern-Woodstock Rubber, Ltd., has announced that as of January 1, 1955, a company which will be known as United Rubber, Ltd., will purchase the Footwear Division of Gutta Percha & Rubber, Ltd., and will also take over the business of Northern-Woodstock Rubber. H. J. Ross will be president and general manager of United Rubber, Ltd.

United Rubber will operate two entirely separate footwear divisions, each with its own sales organization. G. A. Clifford will be the manager of the Northern-Woodstock Division, and E. C. Sharpe will be manager of the G. P. Footwear Division. Mr. Clifford has been associated with Northern-Woodstock for the past thirteen years, most recently as general sales manager. Mr. Sharpe has been associated with Gutta Percha for the past forty-two years, most recently as manager of the Footwear Division.

A. J. McGarry has been named secretary-treasurer of United Rubber, Ltd., the same position he held with Northern-Woodstock, with which he had been associated for the past twenty-six years. United Rubber will maintain headquarters in Toronto, Ont.

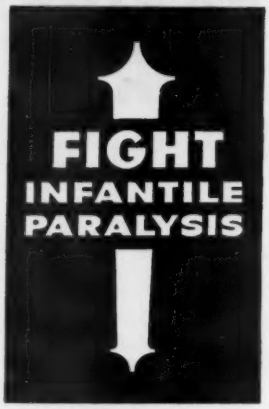
The Fifth Divisional Conference of the Chemical Engineering Division, Chemical Institute of Canada, will be held on March 7 to 9, 1955, in Ottawa, Ont. It is expected that upwards of 300 chemical engineers and industrial chemists will attend. The three-day conference, under the chairmanship of Dr. Paul E. Gishler, will include two days of technical papers. One of the conference features will be a trip to the Chalk River Plant of the Atomic Energy of Canada, Ltd. A security clearance is required of all those taking the trip, and inquiries regarding the trip should be addressed to Dr. W. M. Campbell, Box 323, Deep River, Ont.

W. J. Nicol, formerly chief chemist of Gutta Percha & Rubber, Ltd., Toronto, Ont., has joined the Dunlop Tire & Rubber Goods Co., Ltd.

Robbins Tire Sues Pauley

Another lawsuit involving the financial dealings of Poncet Davis, president of the Robbins Tire & Rubber Co., Tuscumbia, Ala., and Edwin W. Pauley, is now in Federal Court in San Francisco, Calif. In this action, Robbins Tire has filed a $1,100,000 suit against Mr. Pauley and three other individuals and two California companies. The suit states that Robbins Tire owns 41% of the stock in the Pacific Rubber Co. and charges that the individual defendants conspired to conceal a transfer of assets totaling more than $1,000,000 to the Bay Rubber Co., a holding concern, for a nominal figure of $5,000. Bay Rubber, Mr. Pauley and Mr. Davis are also involved in a suit filed last January in Cleveland Federal Court. Here, it was charged by Mr. Pauley and associates, that Mr. Davis had backed out of arrangements to contribute $54,000 of $150,000 to expand the firm. Mr. Pauley asked the court to award him and associates the $54,000. At this time, Mr. Pauley was on trial on four counts of Federal income tax evasion in the same court. He was found guilty of these charges and sentenced to five years in Federal prison and fined $10,000 on each of four separate counts. Mr. Davis is now free on bond pending appeal.

MARCH OF DIMES



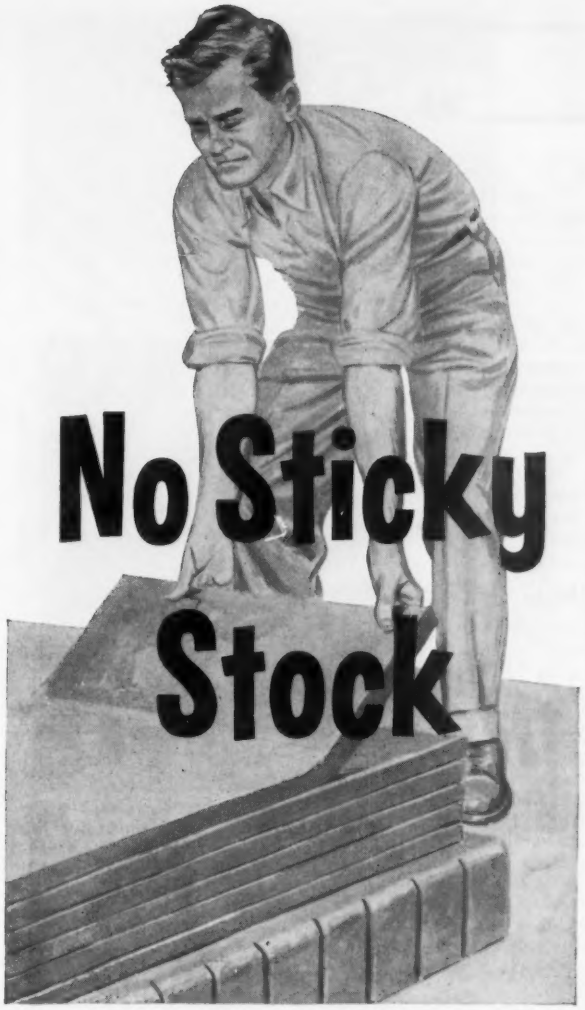
JANUARY 3-31

Cutless Bearings on Forrestal

When the U. S. Navy's newest aircraft carrier "Forrestal" takes to the sea, every revolution of its powerful 7,500-pound propellers will be cushioned in rubber. The rubber cushions will be in the form of newly-designed "Cutless" rubber bearings developed by the B. F. Goodrich Co. Industrial Products Division. The rubber-lined bearings, encased in bronze shells, weigh as much as eight tons each, measure 10 feet in length and nearly 3 feet in diameter. They fit onto massive 22-inch diameter propeller shafts. Mounted four bearings to a shaft, the soft, resilient rubber absorbs shock, vibration and noise caused by the revolving propeller shafts and provides longer life for both bearings and shafts. The special synthetic rubber used to line the bearings is about as thick and resilient as the rubber used for tire treads. It has special resistance to abrasion, greases, chemicals and oils, however, and is strong enough structurally to support the 100,000-pound combined weight of each massive shaft and attached propeller. All of the Navy's World War II aircraft carriers were equipped with earlier models of the Cutless rubber bearing.

Goodyear Stock Split Authorized

Stockholders of the Goodyear Tire & Rubber Co., meeting in Akron, Ohio, on December 20, took action to permit a two-for-one split in the company's common stock, to be effected by issuing to shareholders of record as of December 30, 1954, one additional share for each share then held. With this distribution, the company will have outstanding approximately 9,100,000 shares of an authorized issue of 15,000,000 shares. A reduction in the par value of the common stock from $10 to $5 per share was approved at the December 20 meeting, and action taken to increase the number of shares of common stock released from pre-emptive rights of shareholders for possible sale to employees. The quarterly dividend rate on the old stock was increased from 75c to $1.00 a share at the time the directors authorized the stock split.



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When it comes to keeping rubber unstuck, DuBois is the expert. Regardless of the problem, DuBois eliminates it quickly and efficiently without interfering with subsequent operations.

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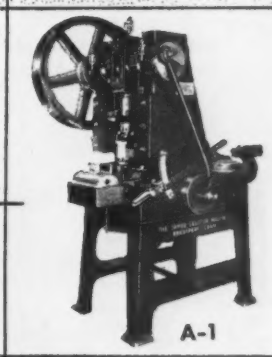
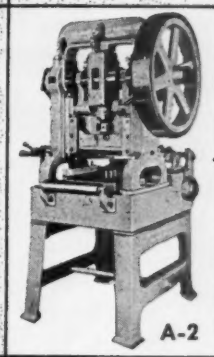


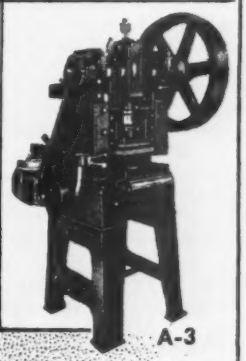
MODEL A-1
Cutting Heels at high speed production or short runs.



MODEL A-2
Cutting Multiple Heels, Half and Full Soles with stock grain.

MODEL A-2s
(Not illustrated)
Cutting across grain of stock.

MODEL A-3
Cutting Multiple Heels and Taps with or across stock grain.



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OBITUARIES

Dr. H. E. Simmons

Dr. Hezzleton E. Simmons, president-emeritus of the University of Akron, died on December 30 at his home in Akron, Ohio. He was 69 years old. Dr. Simmons had suffered a severe heart attack last September and was hospitalized for weeks. He was believed to be on the way to recovery when he was stricken again.

Born in Leroy, Ohio, Dr. Simmons enrolled at the old Buchtel College and soon became intensely interested in rubber chem-

istry. As a junior and senior at Buchtel, he doubled as an assistant instructor in chemistry. After graduation in 1908, he went to the University of Pennsylvania for his master's degree. In 1910, he returned to his alma mater as an assistant professor of chemistry.

This was the beginning of 41 consecutive years as a faculty member at Buchtel College, which later became known as the University of Akron. In 1912, he became a full professor. For a time in 1928, Dr. Simmons directed the University's evening program. In June, 1933, he was named president. His tenure as president saw the University gain tremendous stature, especially in the field of rubber chemistry.

Active in affairs of the Division of Rubber Chemistry of the American Chemical Society, Dr. Simmons, in 1919, served on the Executive Committee of the Rubber Chemistry Section, ACS, which organized the present Rubber Division. He served as secretary of the Rubber Division from 1928 through 1935. In 1952, he was chosen Goodyear Medalist, and delivered the Goodyear Lecture that year at the Fall Meeting of the Division in Buffalo, N. Y.

During his long association with the rubber industry, Dr. Simmons contributed greatly to the rubber literature. His articles appeared in RUBBER AGE, and other technical journals. The deceased held honorary doctor of science and doctor of law degrees from Wooster College and the University of Toledo, and was associated with many scientific and fraternal organizations.

During World War II, Dr. Simmons served for two years as a consultant in the Office of the Rubber Director in Washington, D. C. At the conclusion of the 1950-51 school year, Dr. Simmons announced his retirement. He joined the Goodyear Tire & Rubber Co. as a special consultant. Then, he joined the Firestone Tire & Rubber Co. where he set up and operated the company's scholarship and fellowship program which provides college educations for children of employees.

Services were held on January 3 at the First Universalist Church in Akron, with interment in Rose Hill Cemetery. Classes at Akron University were closed at noon on January 3 so that students and faculty could attend the funreal.

Charles Belknap

Charles Belknap, former president of Monsanto Chemical Co. and vice-chancellor of Washington University, St. Louis, Mo., died on December 29 of a heart ailment. He was 74 years old. Mr. Belknap served as president of Monsanto from March, 1943 to October, 1945, and continued as chairman of the executive committee until his retirement in 1946. He was then appointed to the new post of vice-chancellor of the university and served until 1951. A 1903 graduate of the U. S. Naval Academy, Mr. Belknap served during World War I as chief of the Navy's Overseas Transportation Service. He received the Distinguished Service Medal from both the Army and Navy. He resigned from the Navy in 1919 with the rank of commander. Surviving are his wife and a brother.

Robert E. Heyn

Robert E. Heyn, vice-president in charge of sales for Exquisite Form Brassiere, Inc., died of cancer on November 29 in Mount Sinai Hospital in New York City after an illness of five months. He was 50 years old. An honor graduate of Johns Hopkins University in 1926, Mr. Heyn joined a subsidiary company of the B.V.D. Corp. that same year. Ten years later, at the age of 32, he was made president of the company. In recent years, he served as national sales manager of the International Latex Corp., in charge of the Playtex Girdle Division. He joined Exquisite Form last year. Surviving are his wife and two daughters.

Philip H. Lang

Philip H. Lang, sales manager for the American Felt Co., New York, N. Y., for 24 years, died on November 22 at the Newark Eye and Ear Infirmary after an operation. He was 60 years old. Mr. Lang joined American Felt in 1910 as an office boy in the executive offices. He served in the Army in France during World War I. Surviving are his widow, his father and a brother.

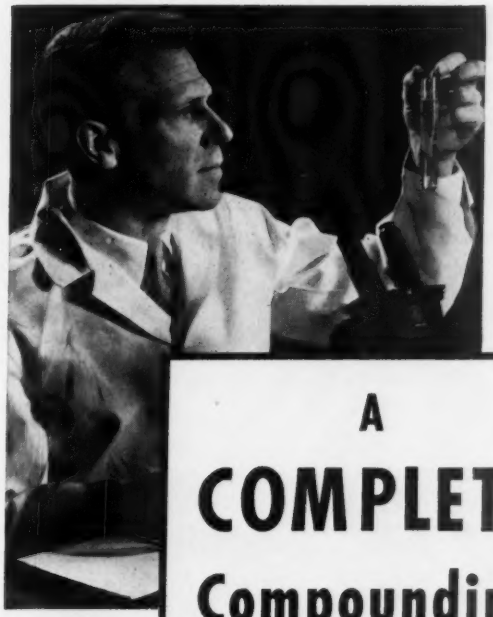
John A. Britton, Jr.

John A. "Jack" Britton, Jr., retired president and director of the Enjay Co., Inc., an affiliate of the Standard Oil Co. of New Jersey, died on December 16 at his home in Short Hills, N. J. He was 66 years old. Mr. Britton, who retired from business in 1953, was a prime figure in the early marketing of Perbunan in the United States. Born in Oakland, Calif., he was graduated from St. Matthew's Military Academy and from the University of California. He

began his career as an engineer for the Pacific Gas and Electric Co. After serving as manager of the Manilla-Shanghai offices of the John Rothchild Co., he joined the Standard Oil Development Co. in 1920 at the Bayway (N. J.) refinery. When Enjay was organized in 1947, Mr. Britton was named a vice-president of that company. In May, 1948, he was named president of the concern, a position he held until his retirement in 1953. Mr. Britton had more than thirty-three years of service with the Standard Oil organization. Widely-known throughout the rubber industry, Mr. Britton had been a member of the New York, Philadelphia and Los Angeles Rubber Groups. He was also a member of the 25-Year Club of the Petroleum Industry, the Society of Automotive Engineers, the Oil Traders Association and the Echo Lake Country Club. Services were conducted on December 18 in Short Hills. Mr. Britton is survived by his wife and son, John A. Britton, III.

John Caswell

John Caswell, long associated with the government's synthetic rubber program, died at his home in Washington, D. C., on December 23. He was 56 years old. Mr. Caswell joined the government in the early days of World War II as special representative to the federal rubber director, William M. Jeffers. Later, he specialized in activities having to do with the synthetic rubber program. His most recent position was in the Rubber Division of the National Production Authority.



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NEW GOODS

Rubbermaid Cup Rack

A new cup rack, designed to allow interchangeable stacking for drying and storing with the Rubbermaid Glass and China Handling Rack, has been introduced by the Wooster Rubber Co., Wooster, Ohio. Company officials report that the new cuprack allows easy and secure stacking and is coated with a heavy duty plastisol, making it resistant to hot water, kitchen acids, grease and detergents. It will not crack or peel. Latest in the company's line, the rack measures 17 by 13½ by 3½

inches and will fit in space normally occupied by a standard serving tray, often used for cup storage. Designed to cut down replacement costs from breakage, the rack does away with labor and handling. The company states that the rack will go through 18 and 19¾-inch dishwashers (inside regular racks) used in restaurants, hotels, institutions, fountains, schools and other food service establishments.

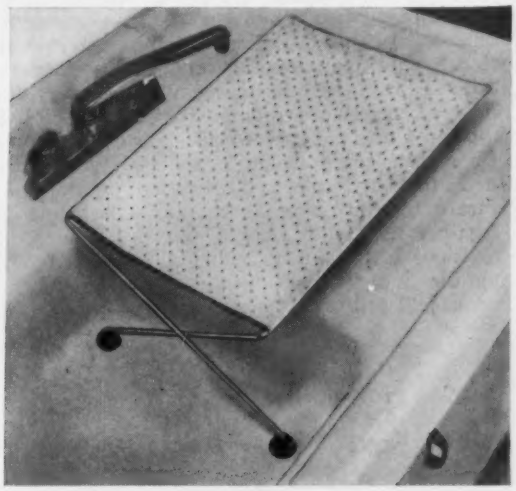
Vacuum Bottle Suction Rings

Ernest H. Hecht, 1133 Broadway, New York 10, N. Y., has announced the availability of a line of acid proof suction rings for vacuum bottles. With these new suction rings, any regular vacuum glass flask may be converted into a suction bottle. Even extremely hot liquids

can be filtered quickly and safely by simply substituting a Pyrex flask for the regular glass flask. As there is no need to pour off liquids and stop suction operations, larger volume can be obtained. The rings are available in sets of three in these sizes: 19 by 66 by 12 mm; 33 by 75 by 12 mm, and 49 by 100 by 12 mm.

Nu-Born Baby Bather

Nu-Born Bather Co., P. O. Box 473, Ottumwa, Iowa, has introduced the "Nu-Born Bather", a new folding unit for bathing the baby. Designed to fit any standard kitchen sink, the unit has a perforated rubber top for



fast draining. Constructed on a sturdy metal frame, the bather has rubber suction cups affixed to the legs so that the unit will not slip in the sink. The Nu-Born Bather may be folded when not in use or for traveling.

New Rubbermaid Kar-Rug

A radical design shift in its main automotive product, the "Rubbermaid Kar-Rug", has just been announced by the Wooster Rubber Co., Wooster, Ohio. The Kar-Rug for the driver's side of the automobile features an

accelerator pedal "lock slot" to prevent sliding and shifting. It, and the companion mat, are available in Rubbermaid "Holiday" colors of red, blue, green, yellow, tan, gray and black. The Kar-Rugs will fit almost all makes and models.

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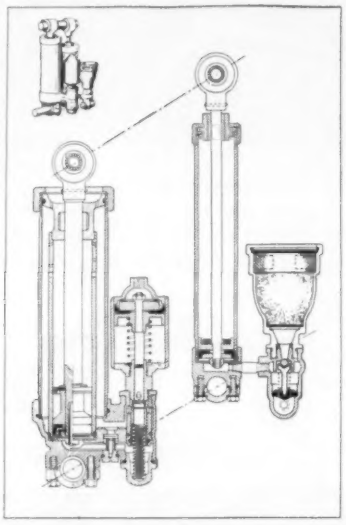
NEW EQUIPMENT

Pantex Hydro-Air Power Unit

A new type pneumatic prime mover, which is said to combine faster action, damped terminal stopping, powerful finish pressures, and full reversibility, and which is reported to find application in connection with presses of all kinds, has been introduced by the Pantex Manufacturing Corp., Pawtucket, R. I. Called the Hydro-Air Power Unit, the unit consists of three cylinders, one for a fast, long pneumatic stroke, a second providing a 12-to-1 hydraulic multiplication of trapped oil pressure for the finishing stroke, and a third to trigger the high-pressure finish stroke.

Provisions in the second cylinder for minimum drag during the fast forward pneumatic stroke, linear deceleration just before the high-pressure hydraulic stroke,



elimination of cavitation on the return stroke, checking of speed at the close of the cycle, and independence from changes in oil viscosity due to temperature—all involve original design details (based upon the tube-within-a-tube construction).

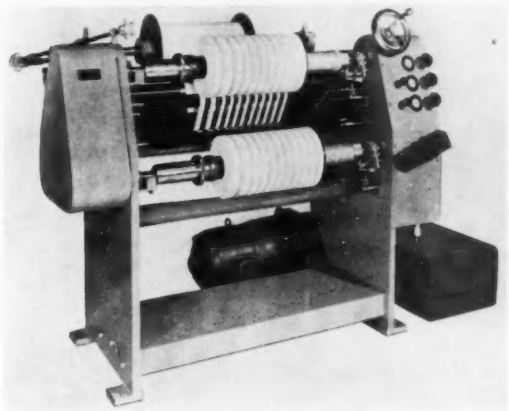
Main stroke speed is adjustable by regulation of the air supply pressure, but does not influence decelerating characteristics. The extra hydraulic closing force at the end of the forward stroke (over and above the straight pneumatic thrust) is fully and independently adjustable from zero to the approximate one-ton or three-ton limit. Pneumatic circuitry is simple and the cycle may be taken in steps timed manually or automatically by easy treadle, lever, button, cam or timer arrangements.

Advantages of the Hydro-Air Unit in press work over other available types are said to include overcoming sacrifice of speed for suitable working pressure, too large space requirements and difficulty of controlling final pressure application, high pressure steam cost and exhaust disposal, and unduly large cylinder sizes and air consumptions. The unit weighs approximately 35 pounds. The standard one-ton model is 16½ inches in over-all closed length and the heavy-duty model is 21 inches.

Plastic Film Slitter and Rewinder

A new slitter and rewinder for use on plastic films of all kinds has been developed by John Dusenbery Co., Inc., Verona, N. J. Called the Model 635 Film Slitter, it is basically a two spindle, center drive, differential rewind slitter, and is recommended by the manufacturer principally for narrow width slittings where positive roll separation and uniform roll density are required.

Major design emphasis was devoted to the differential principle of rewinding wherein the rewind cores are spaced on the mandrel with steel spacer rings keyed to the rewind mandrel. The rewind mandrels are positively driven at a higher speed than the normal winding speed



of the cores. The cores, therefore, slip on the mandrel. In order to produce the necessary winding torque the stack of cores and spacers is squeezed endwise from one end of the rewind mandrel. This endwise force, formerly done by spring collars, is now done by regulated air pressure with a minimum of operator skill.

The differential winding principle tends to distribute the total web pull equally on each roll being rewound. Thus, if the material thickness varies across the web, the thinner sections will wind to a smaller diameter but will have the same density as the thicker caliper, larger diameter, rolls on the same rewind mandrel. The splitting section of the new unit is designed to permit the interchange of four slitting mechanisms: (1) Shear cut; (2) Razor blade cutting in grooved roll; (3) Razor blade slitting in air; (4) Score cut.

The new machines are available in widths from 12 to 52 inches and in three frame sizes to suit rewind diameters from 8 to 24 inches. They are equipped with anti-friction bearings and non-metallic gearing for quiet, maintenance-free operation. Web speeds up to 500 f.p.m. can be attained.

A new and different steam trap, called the **Thermodynamic Steam Trap,** in which the kinetic energy of steam closes the valve, has been introduced by the Sarco Co., Inc., 350 Fifth Ave., New York 1, N. Y. The manufacturer claims trouble-free operation for this new valve based on the fact that the new operating principle permits an extremely simple design, one free of the usual valve mechanisms, devices, fragile parts and narrow channels. The only moving part in the new valve is the valve head.

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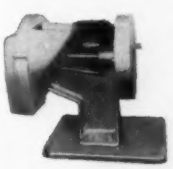

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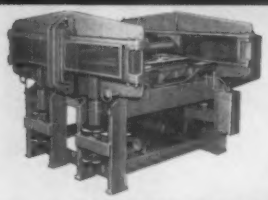

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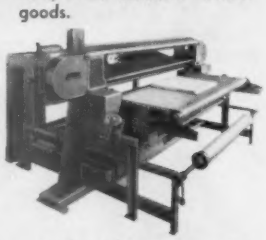

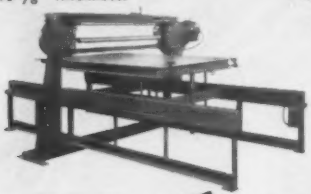

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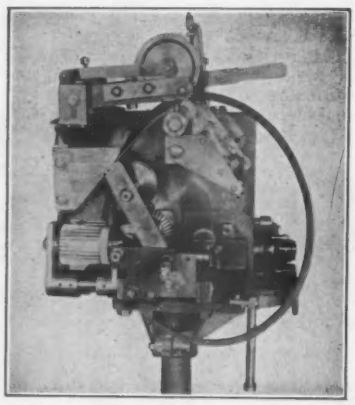

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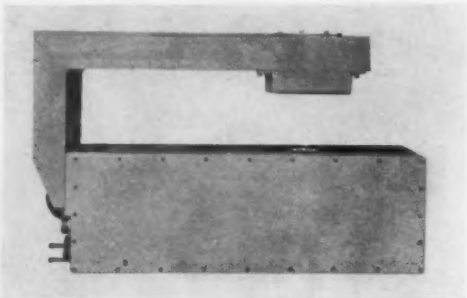
Non-Contacting X-Ray Thickness Gage

The X-Ray Thickness Gage, designed for gaging aluminum foil as thin as .0003 inches and steel as thick as .075 inches with accuracies of one percent, has been announced by Pratt & Whitney, Division Niles-Bement-Pond Company, West Hartford, Connecticut. This new non-contacting continuous mill gage is the latest addition to the complete line of gaging equipment manufactured by this company.

In essence the X-Ray Gage utilizes a split X-ray beam, directing part of the beam through a wedge shaped disc, having a variation in thickness equal to the range of the gage, while the remainder of the beam penetrates



the material being gaged. As the strip progresses through the mill, a difference in thickness between the wedge and the gaged material will cause the electrical balance system to equalize them by revolving the wedge and thus show a meter reading equivalent to this thickness change.

Designed to read deviation in decimal thickness, the gage can very readily be furnished with dual range or even three ranges if required. A recorder may be placed in the circuit to give direct reading of the absolute thickness of the material passing through the gage head. It is placed in the circuit in such a way that it will not affect the standard gage where dial settings are used and deviation is read on an indicating meter. Dual range can be provided on this direct-reading recorder.

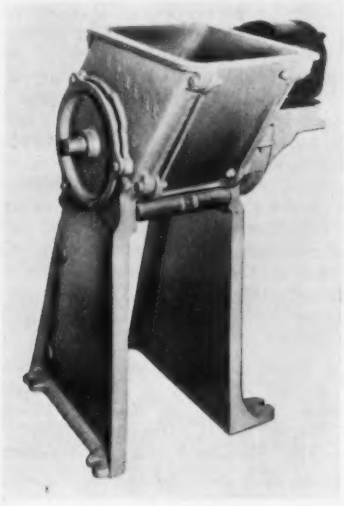
The pass line may vary anywhere in the air gap from top head to bottom head without any change in reading. It is necessary, however, that the pass line be maintained perpendicular to the X-ray beam, since any angularity will introduce an error in the gage reading.

Easy to install and maintain, the X-Ray Thickness Gage will gage any strip material processed through rolling mills in varying ranges up to approximately .075 inches. There is no appreciable effect on gage operation due to fluctuations in voltage or frequency. A voltage regulator is not required for accuracy and no special radiation safety precautions need to be taken.

Model 41-A Pneumatic Controller has been introduced by the Foxboro Co., Foxboro, Mass., as a replacement for the earlier Model 41, providing sharp on-off or narrow band proportional control of such variables as temperature, pressure, liquid level and humidity. When equipped for on-off action, the **new industrial controller** "snaps" the control valve from fully opened to fully closed when the measurement crosses the control point, handling any process with large capacity-demand ratio and negligible lag.

Supreme Dry Ice Crusher

Crushed ice in varying sizes to meet specific requirements of tumbling barrels used for deflashing rubber parts is easily secured through the use of the Supreme Dry Ice Crusher, product of Franklin P. Miller & Son, Inc., 36 Meadow St., East Orange 5, N. J. This unit accommodates the full 50-pound standard block of dry ice and rapidly reduces the block to the crushed size desired at a rate of two to four tons per hour, depending on the crushed size. It can also be utilized to produce almost all powdered dry ice if preferred. Pow-



ered by a 1½ h.p. motor through built in direct gear reduction drive, the crusher is compact, requiring floor space of only 20 by 22 inches and weighing only 325 pounds. When crushed dry ice is used for deflashing and polishing no problem exists in separating the ice from the finished parts, since the dry ice completely sublimes to harmless carbon dioxide gas. Other uses for crushed dry ice in the rubber industry are for embrittlement of rubber for pulverizing, for use as moisture traps in vacuum systems, and for environmental testing.

Bristol Indicating Millivoltmeter

A new indicating millivoltmeter which features short response time and high accuracy, has been announced by the Bristol Company of Waterbury, Conn. The instrument has a newly developed high-torque jeweled millivoltmeter mechanism, with an Alnico V magnet and a self supporting coil. It is equipped with a neutralizing resistance to compensate for changes in coil resistance due to ambient temperature changes. Accuracy of the Model 580 Indicating Millivoltmeter is 1% of full scale value; minimum response time is less than six seconds for 99% response. The indicator can be used as a pyrometer, tachometer, or pH indicator, or for power consumption measurements. It can be used with any primary sensing device which is capable of supplying a millivolt signal to the indicator.

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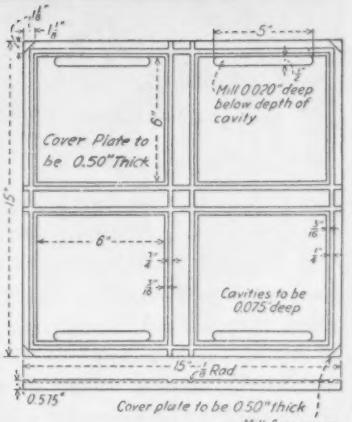
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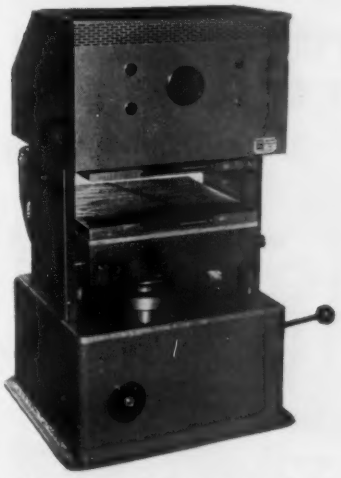

THE P·H·I PRESS*
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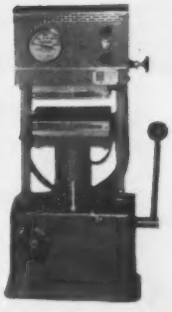

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REVIEWS

BOOKS

Deterioration of Materials. Edited by Glenn A. Greathouse and Carl J. Wessel. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 6 x 9 in. 836 pp. $12.00.

Prepared with the collaboration of 24 specialists, this book describes and analyzes the causes of deterioration in materials and presents proven techniques for preventing or retarding such deterioration. Divided into four sections, it covers the climatic, chemical, physical and biological agents of deterioration and the prevention of deterioration in metals, wood, paper, textiles, leather, plastics, rubber, paint, and many other materials. The four sections are: (1) Some Important Factors in Deterioration; (2) Materials and Their Preservation; (3) Some Assembled Units and Their Preservation; (4) Some Special Aspects of Preservation. Included is a 60-page chapter devoted to plastics and rubber, prepared by Albert Lightbody, Merritt E. Roberts and Mr. Wessel (one of the editors), which contains 150 literature references. The chapter covers the nature of high polymers, the types of polymers, the effect of compounding, and plasticizers. The causes of deterioration in numerous types of plastics and in both natural and synthetic rubbers are outlined and preventive techniques discussed.

•

Methoden zur Chemischen Analyse von Gummimischungen. (Methods for the Analysis of Rubber Compounds). By Horst E. Frey. Published by Springer-Verlag, Reichpietschufer 20, Berlin W. 35, Germany. 5¼ x 8¼ in. 104 pp. (In German). Price: DM 9.60 (approximately $2.25).

With the progress made in rubber technology the demands on the analyst in the laboratory have increased considerably. The purpose of this handbook is to help the analyst replace the old and time-consuming methods with the new and more rapid methods. The author has searched the literature carefully for published methods and includes several of his own. Special attention is paid to both British and American methods. In discussing the various systems for analyzing rubber and rubber compounds, the author indicates that many problems still require clarification and numerous methods proposed in recent years have yet to prove their usefulness. The contents of the handbook are subdivided into the following principal sections: (1) Analysis of mineral ingredients; (2) Carbon black and sulfur; (3) Qualitative and quantitative analysis of organic ingredients; (4) Miscellaneous, including identification of rubber types.

F.P.

•

Symposium on Temperature Stability of Electrical Insulating Materials. (Special Technical Publication No. 161). Published by the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Penna. 6 x 9 in. 140 pp. $2.75.

For years, insulating materials have been divided into several temperature classes based to a large extent on the broad definition of their composition, that is, organic, inorganic, combinations of organic and inorganic, etc. Service experience has served generally to confirm the classifications and to establish the suggested temperature limits for each class. In view of the rapid development of new insulating materials in recent years, it has become increasingly apparent that test methods and standards are necessary as guides for determining the thermal stability of insulating materials. The symposium reported upon in this book is an important part of such effort. Sponsored by ASTM Committee D-9 on Electrical Insulating Materials, this symposium was presented at the 57th Annual Meeting held in Chicago in June, 1954.

Latex Casting. By C. M. Blow and S. C. Stokes. Published by the British Rubber Development Board, Market Buildings, Mark Lane, London, E.C. 3, England. Available from the Natural Rubber Bureau, 1631 K St., N.W., Washington 6, D. C. 5½ x 8½ in. 40 pp.

One of the series of booklets being issued by the British Rubber Development Board under the general title of "Natural Rubber Latex and Its Applications," this booklet treats with casting of latex products. After a brief introduction, it discusses methods and processing, production of hollow articles, production of solid articles, and coloring. Among the specific articles described are soft rubber toys, meteorological balloons, soles and heels, hospital bowls and dishes, bellows, and masks. A special section of the booklet is devoted to abstracts of British patents relating to casting and to heat-sensitization of latex. Author and subject indexes are included. Other booklets issued to date in this special series, which are proving extremely helpful to manufacturers of latex products, cover the origin, properties and manufacture of latex and the manufacture of dipped goods.

•

Practical Refractometry by Means of the Microscope. By Roy M. Allen. Published by R. P. Cargille Laboratories, Inc., 117 Liberty Street, New York 6, N. Y. 6 x 9 in. 60 pp. $1.00.

This text on the determination of indices of refraction of solids by microscopical methods is elementary in nature and particularly bent to beginners in the field. It is also very useful for advanced workers, however. Described in detail are more than 200 available reference specimens for microscopical studies in mineralogy and petrology. Although written primarily for mineralogists (identification of minerals), the methods described can be of great value to almost any user of the microscope. The methods are applicable to inorganic substances, organic crystals and other transparent or translucent solids; therefore, they can be used for identifying constituents of such diverse products as foods, textiles, ceramics, and other commercial products.

•

Monomeric Acrylic Esters. By Edward H. Riddle. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 6 x 9 in. 222 pp. $5.00.

Prepared by a group of research chemists and chemical engineers associated with the Rohm & Haas Co., this book provides a wealth of up-to-date information on commercially available acrylate and methacrylate esters. After a brief history of acrylic monomers and polymers, the physical properties of both the technical grades and purified materials are presented, together with methods of removing inhibitors, explosive limits, toxicity, and satisfactory storage facilities. Subsequent chapters describe methods used to polymerize monomeric acrylic esters, their copolymerization with other monomers, the uses of acrylic esters as intermediates in chemical reactions other than polymerization, and methods of determining the purity of monomers.

•

Aufgabensammlung zur Thermodynamik des Warme- und Stoffaustausches in der Verfahrenstechnik. (Thermodynamic Problems in Heat Exchange Processes). By Dr. Werner Matz. Published by Verlag von Dr. Dietrich Steinkopff, Darmstadt, Germany. 6 x 9 in. 138 pp. (In German). Price: DM 18 (approximately $4.25).

As indicated by its title, this book deals specifically with the problems of heat exchange and since it contains some data on the fundamentals of thermodynamics should prove of some help to chemists and engineers who deal with applied thermodynamics in industry. The book presents some 100 specific problems involving heat exchange and material balance, with possible solutions offered in every instance. The problems cover a wide range, including those concerned with vapor and liquid phases of various substances and those involving distillation, adsorption and extraction. It appears to be a well thought out and carefully planned work.

F.P.

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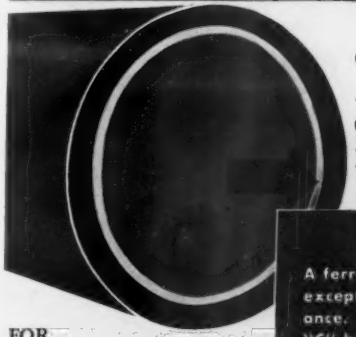

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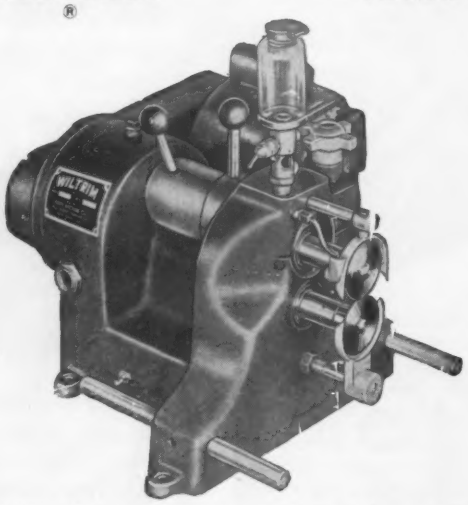

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REVIEWS (CONT'D)

The Physics of Experimental Method. By H. J. J. Braddick. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 5½ x 8½ in. 404 pp. $7.00.

Written for those who plan experiments or design apparatus in such fields as engineering, chemistry, biology, mineralogy, and medicine, this book emphasizes the principles of physical experiment, the currently available resources, and the limitations of contemporary technique. The author is therefore concerned with the statistical analysis of errors, the reduction of observation, and the essential dependence of physical measurement on the properties of various key materials and of their proper use in the construction of apparatus or in the design of instruments. The book includes discussions on errors and the treatment of experimental results, mechanical design, construction materials, vacuum technique, electrical measurements, electronics, optics and photography, the natural limits of measurement, and some techniques of nuclear physics. Dr. Braddick is senior lecturer in the University of Manchester, England, and an active research worker in the field of cosmic rays. A designer of apparatus and instruments, he was particularly concerned with the design of aircraft instruments during World War II.

BOOKLETS, CATALOGS, etc.

Air and Electric Hoists. (Form 5300-A). Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. 8½ x 11 in. 44 pp.

A full line of air and electric hoists for handling bulk materials of all types is described in this comprehensive catalog. Outstanding features of each type and size are carefully outlined along with specifications, capacities, sizes, symbols and accessories available. Many applications in the general industrial field are illustrated as well as a variety of operations in the mining industry for which these heavy-duty units originally were designed. Cross sections of a number of hoists appear throughout the text. Single, double and triple construction hoists as well as drum lengths, frame construction and motor types are discussed and shown in line drawings as are scraper hoist symbols. Full descriptions of two types of remote control units, throttle equipment and several types of brakes all for double or triple drum hoists, are accompanied by photographs and line drawings. Tables covering weights of materials and rope pull required for drawing cars up grades or inclined tracks are included in the useful information which accompanies suggestions for rolling friction allowances.

•

The Story of Employment Opportunities. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 9 x 12 in. 32 pp.

America's industrial system, if allowed to progress unhampered, can provide a quarter again as many jobs by 1975 as it does now. This is the conclusion reached in this booklet which points out that this system can bring 23,000,000 more industrial jobs, and a national total of some 80,000,000. The booklet points out that tomorrow's help wanted advertisement is being written by the research of today. It goes on to show how each new industrial job brings into being non-manufacturing jobs. In a section entitled "Business Biology," the booklet demonstrates how developments in one field spawn employment in others.

•

Bakelite Vinyl Butyral Resins. (Technical Release No. 11). Bakelite Co., 30 East 42nd Street, New York 17, N. Y. 8½ x 11 in. 28 pp.

The latest information on properties and applications of Bakelite vinyl butyral resins is compiled in this new technical booklet. Widely known for their part in making safety glass possible, these resins are growing rapidly in use as wash primers or metal conditioners, wood and metal finishes, adhesives and cloth coatings. Numerous graphs and tables based on recent laboratory data are included in the booklet. Five basic types of wash primer, or metal conditioner, are described in detail.

Thiokol Liquid Polymer Emulsions. Thiokol Chemical Corp., 780 North Clinton Ave., Trenton 7, N. J. 8½ x 11 in. 8 pp.

Methods of preparing stable, water-based emulsions from Thiokol liquid polymer which have recently been developed are described in this bulletin. The emulsions are of fine particle size and are potentially suitable as binders and impregnants for wood, paper, textiles, felt and other water absorptive materials. Other potential applications include flexibilization of water-dispersed phenolic, urea and epoxy resins for coatings and adhesives. Another possible field of interest lies in their use as cutting oil additives. The dispersed Thiokol liquid polymer is an organic polysulfide polymer that can, if desired, be cured to a resilient rubber with excellent oil and solvent resistance, good aging characteristics, impermeability to gases and moisture, and excellent low temperature properties. Preparation of the emulsions is accomplished in a colloid mill. Cationic, anionic and nonionic types with solids contents ranging up to 40% can be simply prepared. Dispersed liquid organic peroxides function as curatives either after exhaustion of the aqueous phase or as a component of a coagulating system.

•

Acetone. (Bulletin F-8650). Union Carbide and Carbon Corp., 30 East 42nd St., New York 17, N. Y. 8½ x 11 in.

Acetone is described in this new data folder as to its physical and physiological properties, specifications, constant-boiling mixtures, general solvent properties, and resin solubilities. In addition, information on its performance in nitrocellulose lacquers is given and other uses are described. The bulletin also contains six easy-to-read charts showing physical properties of interest to users of acetone. Acetone is particularly important as a solvent in the textile, plastic, paint and varnish, and pharmaceutical industries.

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O-16	(Iso-Octyl Palmitate)
TG-8	(Triethylene Glycol Dicaprylate)
TG-9	(Triethylene Glycol Dipelargonate)
DOP	(Di-2 Ethylhexyl Phthalate)
DOA	(Di-2 Ethylhexyl Adipate)
DIOA	(Di-Iso-Octyl Adipate)
DOS	(Di-2 Ethylhexyl Sebacate)
DIOS	(Di-Iso-Octyl Sebacate)
DBP	(Dibutyl Phthalate)

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MARKETS

NEWS-PRICES

NEW YORK, JAN. 6, 1955

Natural Rubber

Since our last report (December 1), the average price of spot rubber on the New York Commodity Exchange has moved in the exceedingly wide range of 700 points, high for the period being 34.50c reached on December 31, and low being 27.50c reached on December 2. The average price of spot rubber for the month of December was 29.88c based on 22 trading days. This compares with an average of 28.07c in November, 1954.

Following the high for the period established on December 31, the market fell off considerably, so that on January 6, the spot price for No. 1 R.S.S. was an even 33c. The gradual decline in rubber prices with the coming of the new year was due basically to profit taking by speculators in the futures market, the trade reports, and in no way materially altered fundamentals within the rubber market itself.

It has long been a market maxim that any decided trend in the market feeds on itself once a price structure gets "out of line." To be sure, the high price of rubber reflects, in the main, the inexorable law of supply and demand. Markets, however, have a way of anticipating developments. It is on this premise that a great many in the trade are now saying "too much has been put on the price structure of rubber."

Burma-Ceylon Rubber Pact?

According to press reports from Ceylon, Burma has offered to negotiate a barter deal with Ceylon on the lines of the Ceylon-Red China pact for the exchange of rice for rubber. Under the arrangement, Burma would supply the same amount of rice as China at a lower price, and receive rubber in exchange. Under the barter deal with Red China, Ceylon ships 50,000 tons of rubber a year for 270,000 tons of rice.

The Burmese proposal has met with no objection from the Chinese side, according to the report. The arrangement would enable Ceylon to revoke her pact with China and thus overcome the hurdle of the U. S. Battle Act concerning trade with potential enemies, which stands in the way of American aid to Ceylon.

In a recent letter to Arthur S. Flemming, director of the Office of Defense Mobilization, John L. Collyer, chairman of the B. F. Goodrich Co., made two proposals to help reduce government spending: (1) The government should stop making "further additions" to the national stockpile of natural rubber, and (2) The government should dispose of the natural rubber now in the stockpile "which might be in excess of the tonnage required for a national emergency."

Government stocks, said Mr. Collyer, run over 1,200,000 long tons. Private industry holds another 100,000 long tons. Mr. Collyer said that these quantities would be enough to take care of essential military and civilian needs during an all-out war of "six to possibly eight years duration," assuming the rubber stocks would not be destroyed, nor synthetic rubber plants crippled by enemy action.

Price Data

Closing Rubber Prices on New York Commodity Exchange (No. 1 R.S.S. Contract)

FROM DECEMBER 2 TO JANUARY 6

Dec.	Spot	Mar.	May	July	Sept.	Sales
2	27.50	27.65	27.55	27.45	27.40	79
3	27.88	28.09	27.99	27.85	27.75	120
4	....	....	....	....	....	....
5	....	....	....	....	....	....
6	28.00	27.95	27.80	27.75	27.65	40
7	28.12	28.30	28.15	28.10	28.00	163
8	28.12	28.25	28.05	28.00	27.95	41
9	28.25	28.29	28.18	28.00	27.90	82
10	28.38	28.40	28.35	28.20	28.20	119
11	....	....	....	....	....	....
12	....	....	....	....	....	....
13	28.62	28.70	28.60	28.45	28.40	90
14	28.75	28.85	28.70	28.55	28.45	147
15	28.88	28.90	28.80	28.60	28.45	89
16	29.38	29.45	29.35	29.20	29.00	140
17	29.50	29.54	29.32	29.20	29.10	121
18	....	....	....	....	....	....
19	....	....	....	....	....	....
20	30.38	30.45	30.28	30.20	30.10	142
21	30.38	30.50	30.25	30.05	30.00	181
22	30.62	30.80	30.40	30.20	30.05	249
23	30.88	31.10	30.58	30.40	30.30	66
24	....	....	....	....	....	....
25	....	....	....	....	....	....
26	....	....	....	....	....	....
27	32.50	32.40	31.83	31.70	31.63	205
28	32.38	32.35	31.75	31.55	31.35	100
29	33.50	33.40	32.80	32.60	32.50	192
30	33.50	33.50	32.80	32.55	32.30	205
31	34.50	33.40	33.40	32.90	32.65	61
Jan.						
1	....	....	....	....	....	....
2	....	....	....	....	....	....
3	34.25	34.40	33.40	32.90	32.50	320
4	33.25	32.90	32.00	31.40	31.00	289
5	32.25	31.90	31.10	30.67	30.30	198
6	33.00	32.99	32.25	31.65	31.25	204

Outside Market

No. 1 Ribbed Smoked Sheets:	
Spot	.33
January	.32⅞
February	.32¾
Thin Latex Crepe:	
Spot	.35¼
Thin Brown Crepe, No. 2	.31¾
Flat Bark Crepe	.29½

London Market

(Standard Smoked Sheets)

February	33.97 - 34.26
Apr.-June	32.37 - 32.66

Singapore Market

(Standard Smoked Sheets)

February	31.21 - 31.35

Synthetic Rubber

(Dry Types—Per Pound)

Butaprene NF	.490	.500
Butaprene NL	.500	.510
Butaprene NAA	.540	.550
Butaprene NXM	.580	.590
Chemigum 30N4NS	.500	.510
Chemigum 50N4NS	.500	.510
Chemigum N3	.580	.590
G-E Silicone Rubber (compounded)	2.50	3.60
G-E Silicone Gum (not compounded)	4.00	4.20
GR-I	——	.230
GR-S	——	.230
Hycar OR-15	.580	.590
Hycar OR-25	.500	.510
Hycar OS-10	.550	.560
Neoprene Types AC and CG	——	.550
Neoprene Type GN	——	.410
Neoprene Type GN-A	——	.410
Neoprene Type GRT	——	.420
Neoprene Type KNR	——	.750
Neoprene Type S	——	.420
Neoprene Type W	——	.390
Neoprene Type WRT	——	.450
Paracril B	.500	.510
Paracril BJ	.500	.510
Paracril C	.580	.590
Polysar "S" Types	——	.230
Polysar Butyl Types	——	.230
Polysar Krynol	——	.189
Polysar Krynol NS	——	.194
Polysar Krynac	.500	.510
Polysar Krynac 801	.580	.590
Polysar SS-250-K	.300	.310
Silastic (compounded)	1.95	.338
Thiokol Type A	——	.470
Thiokol Type FA	——	.640
Thiokol PR-1	——	.950
Thiokol Type ST	——	1.000

Middling Upland Quotations

	Dec. 1	January 6		
	Close	High	Low	Close
Mar.	34.45	34.62	34.54	34.56
May	34.70	34.92	34.84	34.86
July	34.61	35.06	34.98	35.00

Synthetic Rubber

At the conclusion of the negotiation period for the disposal of the government-owned synthetic rubber facilities (midnight, December 27, 1954), contracts had been signed for the sale of 24 of the 27 facilities for the production of synthetic rubber. On the whole, the Rubber Producing Facilities Disposal Commission performed its task efficiently, coming up with contracts insuring the production of 688,600 long tons of GR-S and 90,000 long tons of Butyl.

In some aspects, the Commission did better than expected in arranging for the sale of the 128,000 short ton alcohol-butadiene unit at Kobuta, Penna., to the Koppers Co., and in leasing the other alcohol-butadiene unit at Louisville, Ky., to Publicker Industries, Inc.

While the completion of signed contracts was announced, no statement was made as to the actual bids which had been submitted. It is assumed that this information will be forthcoming when the Disposal Commission submits its contract recommendations to the Congress.

Before the death of Representative Paul Shafer (Rep., Mich.), the most quoted figure for a "full, fair value" price ranged between $300,000,000 and $350,000,000. The net book value of all the copolymer plants as of December 31, 1952, totaled $76.323,000, while the net book value of the Butyl plants as of the same date totaled $17,604,000.

As of the December 31, 1952, date, the petroleum-butadiene plants had a net book value of $46.255,000, while the alcohol-butadiene plants had a net book value of $22,131,000. The one styrene plant, as of the above date, had a net book value of $4,199,000, and the only chemical plant in the program had a net book value of $158,000.

Net Book Value Totals

Totaling the net book values for all the 27 plants in the government's facilities, a figure of $166,640,000 is arrived at. From this must be taken the net book value of the three plants which remained unsold; the 44,000 long ton GR-S plant at Baytown, Texas, with a net book value of $5,404,000: the 122,000 long ton GR-S plant at Institute, West Va., with a net book value of $7,471,000; and the alcohol-butadiene unit which was leased to Publicker Industries, and which had a net book value of $9,455,000.

When these figures are deducted from the total net book value of all the plants, it is seen that the total net book value of the plants which have been contracted for is $144,310,000.

No one can say, at this point, what will occur when the Disposal Commission reports to Congress on the contracts it has negotiated for sale of the plants. It may be that in the present harmonious relationships which exist between the presently Democratic-controlled Congress and President Eisenhower, that the contracts will be approved as submitted.

There is the possibility, however, that more than a little opposition will be voiced about the whole disposal scheme. It may be that cries of "monopoly" and "give-away" will yet be heard. Whether these objections will be politically motivated, or whether they will express the legitimate opinions of some legislators, the disposal story is not yet over. Events of the next few months will largely determine the future course of the American rubber industry.

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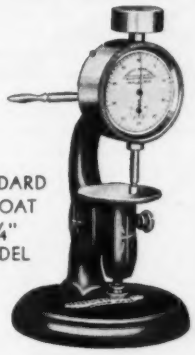

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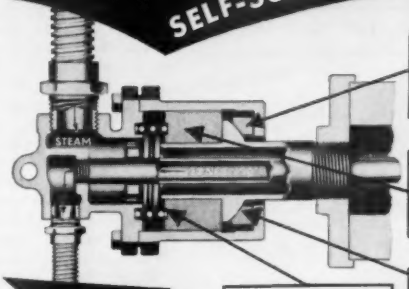

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MARKETS

NEWS-PRICES

NEW YORK, JAN. 6, 1955

Reclaimed Rubber

According to preliminary estimates by the U. S. Department of Commerce, a total of 208,418 long tons of reclaimed rubber were produced in the first ten months of 1954, against the 253,151 long tons produced in the first ten months of the previous year.

Consumption in the first ten months of 1954 ran to 201,981 long tons, contrasted with the 243,554 long tons consumed in the first ten months of 1953. Imports of reclaim through October, 1954, were 840 long tons, against the 2,399 long tons imported in the first ten months of the prior year.

The Department estimates that as of October 31, 1954, there were 30,873 long tons of reclaimed rubber in stocks. This compares with the 30,692 long tons which were on hand as of October 31, 1953.

The price structure for reclaimed rubber remains stable, with little changes reported. Current prices follow:

(Prices for All Areas Except Calif.)

	per lb.
Premium Grade Whole Tire	.10½
First Line Whole Tire	.10
Second Line Whole Tire	.09½
Third Line Whole Tire	.09¼
Fourth Line Whole Tire	.08¾
Black Carcass	.14½
No. 1 Light Colored Carcass	.20¾
No. 1 Select Peel	.11¾
No. 1 Peel	.10½
Butyl Tube Reclaim	.12½
Natural Rubber Black Tube	.15
Natural Rubber Red Tube	.21
Natural Rubber Gray Tube	.21

Scrap Rubber

The scrap rubber market continues on an uneventful course with activity slower than usual because of the holidays during the period. Reflecting on business during 1954, Milton Kushkin (Schulman), president of the Scrap Rubber and Plastics Institute of the National Association of Waste Material Dealers, Inc., stated that the scrap rubber picture in 1954 was practically a duplicate of 1953, which was a poor year.

He notes that the activity in Butyl tubes is primarily due to their use in tubeless tires. How long this demand for Butyl reclaim will last is "anybody's guess." Not much business was done during the year on any of the specialties. Only a few selected grades were moved regularly, and prices were relatively low. All in all, the outlook for scrap is not bright, he opines.

(Prices Delivered Akron)

Mixed tires	ton	13.50
Light colored carcass	lb.	.05½
No. 1 peelings	ton	45.00
No. 2 peelings	ton	30.00
No. 3 peelings	ton	24.00
Buffings	ton	17.00
Truck and Bus S.A.G.	ton	17.00
Passenger S.A.G.	ton	15.00
Natural Rubber Red Tubes	lb.	.08
Natural Rubber Black Tubes	lb.	.05¾
Butyl Rubber Tubes	lb.	.04½

Tire Fabrics

According to reports from the trade, tire yarn manufacturers still are working their way out of a slump, but it is expected that 1955 will be a fairly good year. The reason for this optimism is that inventories in the hands of tire producers, which had been heavy, are now down to workable levels once again.

Production of all synthetic tire yarns in 1954, including nylon, was about 370,000,000 pounds, the smallest in the postwar period. In 1955, producers hope to ship about 400,000,000 pounds, with automobile production estimated at about 5,500,000 cars and less than 1,000,000 trucks.

About two-thirds of the tire business is done on a replacement basis. With close to 60,000,000 cars on the road, the tire yarn manufacturers are not too concerned about their industry, but there is some uneasiness in management circles as to whether production facilities are geared too high for "normal" demand.

When plans for much of the tire yarn industry's present facilities were being perfected, the automobile industry was producing passenger cars at a 6,700,000 annual rate, and trucks at a 1,500,000 annual rate, or about 8,200,000 vehicles each year. This was in 1950. Total passenger car, truck and bus annual production has averaged about 6,500,000 vehicles yearly since 1952.

This considerable drop in automotive production not only had a direct effect on tire yarn producers because of the loss to the market of about 9,000,000 tires in each of the last two years, but there was also an additional loss of about 20,000,000 tires which would have been bought as replacement later on.

Tire Yarn Capacity

The capacity of the tire yarn industry to produce is estimated to be 478,000,000 pounds a year. This capacity is measured by the productive potential of the industry under normal conditions, and allows for normal shutdowns and repair. The tire cord industry operates 24 hours a day.

At the current rate of automobile production, the apparent consumption of first sale and replacement tires would require a yearly production of not much more than 400,000,000 pounds of tire yarn, according to some trade estimates. Most producers would disagree with this figure, estimating potential sales several million pounds higher each year.

Although the industry has been operating on a curtailed basis for more than a year, the prices of tire cord have held up well. Tire cord prices have been relatively stable for several years, in fact. At no time, even during the Korean crisis, did they rise above 62½c a pound, and at their lowest postwar point in early June, 1950, the price for the 1650 denier size was 55c per pound. Industry spokesmen say there is no present prospect of a decline in prices despite lower demand.

(Prices f.o.b. Shipping Point)

Rayon Tire Cord		
1100	lb.	.76½
1650	lb.	.73½
2200	lb.	.73
Nylon Tire Cord		
210	lb.	2.00
840	lb.	2.00
Rayon Graded Fabric		
1100	lb.	.72
1650	lb.	.69½
2200	lb.	.68½
Cotton Chafers		
14.4 oz. (per square yard)	lb.	.74
9.25 oz. (per square yard	lb.	.69½
11.65 oz. (per square yard)	lb.	.66
8.9 oz. (per square yard)	lb.	.71

Liquid Latex

Natural: According to Latex & Rubber, Inc., estimates of U. S. requirements for Hevea latex during the first half of 1955 are optimistic, running well over 7,000 tons per month. Elsewhere in the world, all indications are that additional increases will be realized.

During 1954, not all the consumption capacity was utilized, and during the year there were two lengthy strikes which curtailed production. In addition, 1955 will see the completion of new facilities for the production of foam rubber.

The production capacity for concentrated Hevea latex in the Far East was not fully utilized in 1954. It is, therefore, reasonable to assume that the U. S. will be able to obtain all the latex it wants to buy upon 4 to 6 months' advance notice. At this time, current prices for U. S. bulk latices are in the range of 35½ to 40c.

Synthetic: GR-S latex consumption in October, 1954, increased appreciably over the levels evidenced in the previous months. This rise is expected to be sustained as the price of Hevea latex continues to rise.

In the first nine months of this year, 32,446 long tons of GR-S latex were produced, 30,759 long tons consumed, and stocks as of September 30, 1954, stood at 4,504 long tons. Preliminary figures for October, 1954, show that 5,046 long tons were produced, 4,314 long tons consumed, 144 long tons imported, and stocks at the end of the month stood at 4,868 long tons.

Commerce Department figures show that in October, 1954, 742 long tons of neoprene latex were produced, 562 long tons consumed, and stocks at the end of the month stood at 962 long tons. In the same month, 780 long tons of N-type latex were produced, 328 long tons consumed, and stocks at the end of the month stood at 990 long tons.

Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the rather narrow range of 50 points since our last report (December 1), high for the period being 35.25c reached on December 27, and low being 34.75c reached on December 2. The average price of middling uplands for the month of December was 35.03c based on 22 trading days. This compares with an average of 34.80 in November, 1954.

According to advices from Bombay, the Indian government has agreed to purchase $20,000,000 worth of American long staple cotton under a long term loan negotiated under the U. S. aid program. This would mean a purchase of 120,000 bales of American cotton representing India's normal annual imports of long staple cotton from the U. S. Washington reports that the arrangement is being discussed, but no formal authorization has been issued.

The Department of Agriculture reports that the 1954-55 supply of cotton in the U. S. is relatively large, but the probable disappearance will be substantially larger than in 1953-54. As a result, the carryover on August 1, 1955, will be only slightly larger than the 1954 figure of 9,600,000 bales. Production plus exports are expected to total about 13,500,000 bales. In 1953-54, disappearance totaled about 12,400,000 bales.

The estimated disappearance during the current market year includes exports of about 4,500,000 bales, and domestic mill consumption of about 9,000,000 bales.

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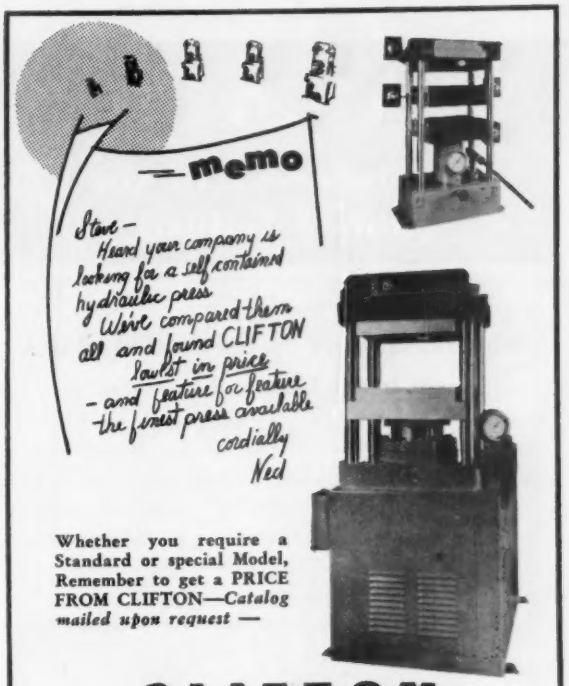
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STATISTICS

of interest to the rubber industry

Natural Rubber in the United States

(Including Latex and Guayule)

(All Quantities in Long Tons)

Year	New Supply	Consumption	Re-Exports	Stocks On Hand at End of Period
1925	400,423	388,500	14,827	51,215
1926	417,643	366,200	17,671	72,510
1927	431,246	373,000	27,775	99,282
1928	439,731	437,000	32,159	65,454
1929	565,087	467,400	36,485	118,609
1930	487,628	376,000	30,205	201,000
1931	501,788	355,200	25,609	322,000
1932	414,668	336,700	20,937	379,000
1933	418,902	412,400	20,576	365,000
1934	463,018	462,500	23,856	355,000
1935	467,146	495,500	11,391	303,000
1936	488,145	575,000	12,582	223,000
1937	600,479	543,600	7,902	262,204
1938	411,983	437,031	5,652	231,500
1939	499,473	592,000	13,125	125,800
1940	818,243	648,500	7,060	288,864
1941	1,029,007	775,000	5,376	533,344
1942	282,653	376,791	10,856	422,714
1943	55,329	317,634	20,815	139,594
1944	107,834	144,113	9,665	93,650
1945	135,672	105,429	6,743	118,715
1946	400,687	277,597	4,338	237,467
1947	688,354	562,661	4,101	129,038
1948	735,227	627,332	6,673	141,541
1949	660,792	574,522	6,253	106,619
1950	802,249	720,268	8,644	89,215
1951	733,048	454,015	2,603	76,569
1952	805,997	453,846	3,024	95,260
1953	647,150	553,473	8,376	112,316
1954:				
Jan.	47,140	46,960	648	112,679
Feb.	42,645	46,897	638	115,228
Mar.	47,721	53,709	460	112,829
Apr.	49,855	51,451	918	106,564
May	55,983	51,398	355	104,377
June	66,698	54,253	524	104,541
July	40,614	39,894	565	109,564
Aug.	59,124	38,069	359	124,810
Sept.	48,618	52,412	499	119,191
Oct.	.....	56,167	429	116,195

Source: U. S. Department of Commerce.

U. S. Imports of Natural Rubber

Year	Dry — Long Tons	Dry — Declared Value	Latex — Long Tons	Latex — Declared Value	Total Imports
1937	574,600	237,307,041	23,185	10,213,670	597,785
1938	397,640	125,373,864	11,944	4,168,127	409,584
1939	469,946	167,586,780	27,437	10,467,552	497,383
1940	781,202	303,308,823	33,789	14,593,466	814,991
1941	989,498	401,976,317	34,797	15,965,627	1,024,245
1942	266,276	112,537,426	10,646	5,630,667	276,922
1943	50,358	31,369,198	1,890	1,312,202	52,248
1944	103,847	73,908,549	3,091	2,092,211	106,938
1945	134,408	95,814,102	4,773	3,115,853	139,181
1946	376,502	228,796,110	8,421	5,843,085	384,923
1947	691,087	306,951,814	17,542	9,787,722	708,629
1948	702,293	290,849,177	32,745	18,288,223	735,038
1949	630,808	225,343,624	29,743	14,968,650	660,551
1950	747,109	416,222,598	54,401	41,764,486	801,510
1951	677,874	727,343,348	54,963	80,178,309	732,837
1952	756,987	578,179,519	48,228	40,563,116	805,215
1953	571,635	284,909,223	75,511	46,353,333	647,146
1954:					
Jan.	41,744	15,981,655	5,396	2,696,694	47,140
Feb.	36,964	14,148,159	5,681	2,931,860	42,645
Mar.	42,039	15,823,475	5,682	3,031,963	47,721
Apr.	44,193	16,605,910	5,663	2,855,180	49,856
May	52,177	19,493,956	3,806	1,907,249	55,983
June	60,108	23,432,566	6,590	3,515,531	66,698
July	35,334	14,694,340	5,236	2,915,484	40,570
Aug.	51,553	22,840,397	7,571	4,374,067	59,124
Sept.	42,138	18,658,983	6,480	3,904,819	48,618

Source: Bureau of the Census, U. S. Department of Commerce.

World Production of Natural Rubber

(Including Latex)

(Long Tons)

Year	Malaya	Indonesia	Ceylon	Viet Nam & Cambodia	Latin America	Rest of World*	Total*
1942	155,000*	200,000*	101,500	76,177	35,794	71,476	640,000
1943	75,000*	100,000*	105,500	70,370	41,900	72,507	465,000
1944	25,000*	50,000*	98,500	60,419	49,946	77,002	360,000
1945	8,600*	10,000*	97,500	12,000*	47,125	73,570	250,000
1946	403,719	175,000*	94,000	19,975	39,678*	105,080	837,500
1947	646,362	277,951	89,000	38,128	34,928*	172,792	1,260,000
1948	698,189	432,349	95,000	43,935	29,158*	226,056	1,525,000
1949	671,503	432,996	89,500	43,010	27,318*	225,907	1,490,000
1950	694,090	696,472	113,500	48,482	26,902*	279,541	1,860,000
1951	605,346	814,406	105,000	52,136	29,777*	277,716	1,885,000
1952	584,238	749,241	96,500	63,134	35,475*	260,111	1,790,000
1953	574,390	692,164	98,610	74,545	35,318*	249,894	1,725,000
1954:							
Jan.	49,424	59,273	10,008	7,958	3,520*	22,717	152,500
Feb.	43,366	53,391	6,333	1,234	2,367*	20,246	127,500
Mar.	42,130	60,000	4,540	3,119	2,451*	25,309	137,500
Apr.	40,223	58,217	7,246	4,437	2,978*	19,088	132,500
May	46,285	55,748	5,296	5,738	2,441*	17,707	132,500
June	43,202	54,696	7,713	6,232	1,281*	23,509	137,500
July	54,014	72,970	8,014	7,160	2,158*	22,544	165,000
Aug.	52,509	58,980	7,961	6,650	1,684*	21,470	150,000
Sept.	53,552	70,013	8,229	....	500*	22,741	165,000

Source: International Rubber Study Group. * Estimated.

World Consumption of Natural and Synthetic Rubber

(Including Latex)

(Long Tons)

Year	United States	United Kingdom	Canada	Europe*	Rest of World*	Total*
1943	488,525	66,730	32,896	150,000	156,104	907,500
1944	710,783	86,977	34,310	132,500	160,690	1,125,000
1945	799,009	91,047	41,836	87,500	108,164	1,127,500
1946	1,039,296	126,770	39,196	145,000	115,804	1,467,500
1947	1,122,327	156,399	61,452	242,500	153,548	1,735,000
1948	1,069,404	196,286	62,121	392,000	182,379	1,902,500
1949	988,903	186,622	56,362	446,500	207,388	1,887,500
1950	1,258,557	222,425	68,695	448,500	287,055	2,285,000
1951	1,214,298	238,101	70,809	476,500	314,941	2,312,500
1952	1,261,413	202,179	67,099	550,000	254,901	2,335,000
1953	1,338,309	211,453	73,394	521,000	343,606	2,487,500
1954:						
Jan.	97,133	20,862	5,643	42,000	33,857	200,000
Feb.	95,957	17,985	6,564	45,500	26,936	192,500
Mar.	109,769	19,796	6,519	46,250	30,981	212,500
Apr.	105,105	20,432	5,972	42,500	43,028	217,500
May	104,026	19,523	6,202	42,000	28,548	200,000
June	111,448	18,713	6,461	41,000	30,039	207,500
July	79,446	18,295	4,758	42,500	28,492	175,000
Aug.	80,120	14,902	4,772	38,000	35,728	172,500
Sept.	105,861	20,114	6,268	44,000	38,482	215,000
Oct.	114,041	.....	....	.....	.....	.....

Source: International Rubber Study Group. * Estimated.

U. S. Gross Imports of Balata, Jelutong, Gutta-Percha, etc.

(All Quantities in Long Tons)

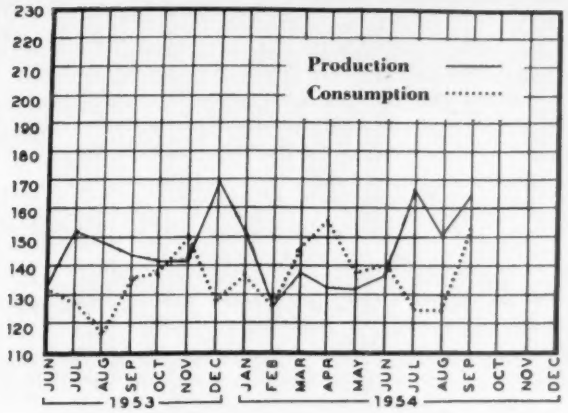
Year	Balata — Tons	Balata — Value	Jelutong — Tons	Jelutong — Value	Gutta-Percha & Other Guttas — Tons	Gutta-Percha & Other Guttas — Value
1943	1,047	708,701	35	14,840	....	.....
1944	1,012	660,805	88	45,578	10	4,999
1945	1,361	907,253	....	.....	36	21,970
1946	2,281	2,233,065	304	256,169	423	458,064
1947	1,982	2,276,531	2,878	1,496,887	392	779,591
1948	1,195	805,078	3,401	2,377,765	423	542,788
1949	1,391	814,554	1,043	834,978	197	189,021
1950	2,117	1,589,885	1,789	1,515,162	541	745,418
1951	2,452	1,973,271	1,669	2,608,359	383	430,539
1952	988	762,994	1,636	2,094,983	282	385,890
1953	1,619	866,248	1,027	1,166,837	235	303,116
1953:						
Dec.	342	148,582	56	55,136	60	33,175
1954:						
Jan.	61	30,769	74	60,746	9	23,425
Feb.	44	18,583	98	88,964	33	28,464
Mar.	19	22,053	59	73,541	19	17,213
Apr.	131	64,025	226	312,654	54	45,733
May	90	35,350	192	232,496	27	37,329
June	87	36,745	318	392,687	97	126,979
July	104	54,957	201	240,477	24	37,749
Aug.	30	23,404	151	200,944	58	68,298
Sept.	107	43,193	313	335,832	37	32,492

Source: U. S. Department of Commerce.

STATISTICS at a glance

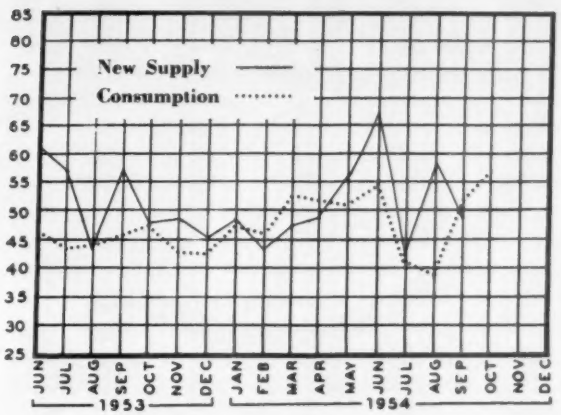
NATURAL RUBBER—WORLD

(thousands of long tons)



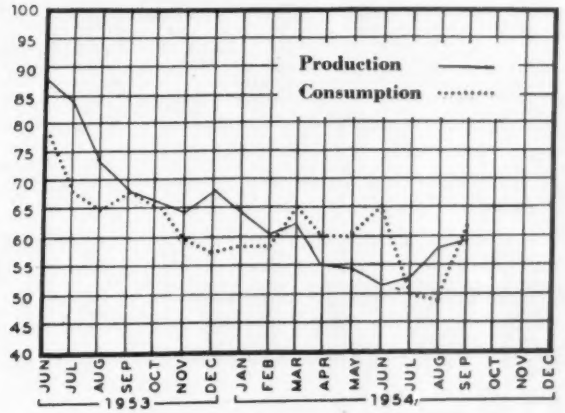
NATURAL RUBBER—UNITED STATES

(thousands of long tons)



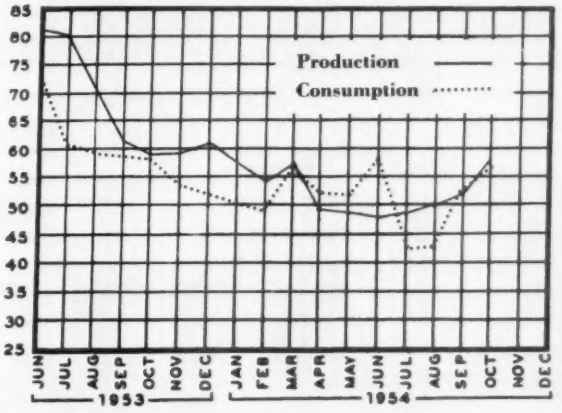
SYNTHETIC RUBBER—WORLD

(thousands of long tons)



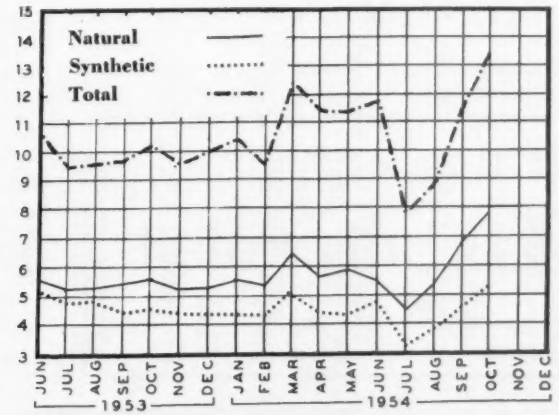
SYNTHETIC RUBBER—UNITED STATES

(thousands of long tons)



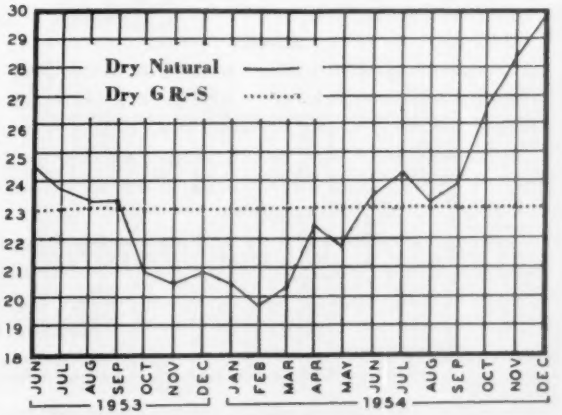
LATEX CONSUMPTION IN THE U. S.

(thousands of long tons)



PRICES—NATURAL AND SYNTHETIC

(cents per pound)



Synthetic Rubber in the United States

(All Quantities in Long Tons)

New Supply

Year	GR-S	Neoprene	Butyl	N-Type	Total
1945	724,859	45,672	52,378	7,871	830,780
1946	613,408	47,766	80,823	5,738	747,735
1947	408,858	31,495	62,824	6,618	509,795
1948	405,492	34,848	56,662	7,012	504,014
1949	310,599	35,215	54,046	11,072	410,932
1950	378,887	50,067	60,915	12,037	501,906
1951	704,529	58,907	76,475	15,333	855,244
1952	654,854	65,745	81,630	16,228	818,447
1953	680,728	80,495	79,801	20,198	861,222
1954:					
Jan.	44,377	6,513	5,539	1,620	58,049
Feb.	41,691	6,206	4,801	1,574	54,272
Mar.	44,464	5,190	5,214	1,900	56,768
Apr.	35,551	5,601	6,004	1,645	48,801
May	36,237	4,828	4,581	1,960	47,606
June	37,092	5,101	3,182	1,696	47,071
July	36,803	4,673	4,960	1,814	48,250
Aug.	38,646	5,313	5,003	1,624	50,586
Sept.	41,120	6,036	4,675	1,718	53,549
Oct.	43,991	6,644	5,117	1,864	57,616

Consumption

1945	600,145	42,394	43,012	8,029	693,580
1946	632,126	44,357	79,228	5,988	761,699
1947	448,589	37,703	68,838	4,536	559,666
1948	345,313	32,118	58,870	5,771	442,072
1949	299,420	31,753	50,855	8,827	414,381
1950	416,230	43,781	66,348	11,930	538,289
1951	626,444	48,887	70,500	13,066	758,897
1952	666,420	55,522	71,229	13,866	807,037
1953	624,181	65,900	77,826	16,929	784,836
1954:					
Jan.	38,689	4,774	5,438	1,272	50,173
Feb.	37,707	4,467	5,696	1,190	49,066
Mar.	43,136	5,177	6,300	1,447	56,060
Apr.	41,324	4,694	6,241	1,395	53,654
May	41,174	4,486	5,602	1,366	52,628
June	44,974	4,769	5,961	1,491	57,195
July	32,800	3,499	4,108	1,145	41,552
Aug.	32,396	4,647	3,569	1,439	42,051
Sept.	42,198	5,049	5,138	1,493	53,878
Oct.	46,744	4,756	4,622	1,460	57,582

Exports

1945	76,555	5,837	980	406	83,778
1946	68,763	2,642	495	797	72,697
1947	7,951	2,617	62	755	11,385
1948	1,093	2,875	21	885	4,874
1949	1,401	3,330	178	1,574	6,483
1950	900	4,826	31	1,895	7,652
1951	483	6,825	216	1,725	9,249
1952	9,467	9,813	126	2,695	22,101
1953	7,692	11,494	237	3,245	22,668
1954:					
Jan.	618	434	0	295	1,347
Feb.	508	1,251	2	287	2,048
Mar.	1,265	930	416	288	2,899
Apr.	520	1,296	62	454	2,332
May	1,115	844	373	395	2,727
June	881	694	216	215	2,006
July	1,126	1,220	421	358	3,125
Aug.	1,314	945	384	307	2,950
Sept.	785	978	53	270	2,086
Oct.	1,050	962	219	259	2,490

Stocks

1945	170,571	9,703	18,378	4,802	203,454
1946	81,486	10,470	19,478	3,755	115,186
1947	40,606	5,237	13,184	3,339	62,366
1948	96,282	5,072	10,995	2,762	115,111
1949	77,731	4,654	12,224	3,433	98,042
1950	36,942	5,733	7,243	2,840	52,758
1951	105,271	8,379	12,481	3,821	129,912
1952	83,861	8,535	22,716	3,875	118,987
1953	135,153	11,480	24,866	4,346	175,845
1954:					
Jan.	138,692	13,065	24,733	4,349	180,839
Feb.	143,202	12,518	23,573	4,112	183,405
Mar.	145,178	12,575	22,329	4,202	184,284
Apr.	136,446	12,665	21,673	4,199	174,983
May	131,604	11,467	20,077	4,435	167,583
June	124,678	10,646	17,534	4,314	157,172
July	128,752	11,315	18,150	4,727	162,944
Aug.	135,164	10,710	19,672	4,613	170,159
Sept.	128,313	10,288	18,513	4,548	161,662
Oct.	127,600	11,168	18,615	4,328	161,711

Source: U. S. Department of Commerce.

Natural and Synthetic Rubber Latex in the United States

(All Quantities in Long Tons)

New Supply

Year	Natural	GR-S	Neoprene	N-Type	Total Synthetic	Grand Total
1942	9,595	.....	210	.....	210	9,805
1943	1,890	194	1,512	.....	1,706	3,596
1944	3,090	6,580	4,683	.....	11,263	14,353
1945	4,768	15,176	7,077	.....	22,253	27,021
1946	8,012	24,810	13,595	.....	38,405	46,417
1947	17,675	22,474	6,089	.....	28,563	46,238
1948	32,630	21,494	5,022	.....	26,516	59,146
1949	29,974	21,357	3,651	.....	25,008	54,982
1950	54,401	31,339	5,725	.....	37,064	91,465
1951	54,963	32,972	6,866	2,948	42,786	97,749
1952	48,228	42,273	7,598	4,164	54,035	102,263
1953	75,511	48,112	9,026	5,844	62,982	138,493
1953:						
Oct.	6,537	3,654	753	733	5,140	11,677
Nov.	4,826	3,715	754	352	4,821	9,647
Dec.	7,168	3,900	636	490	5,026	17,220
1954:						
Jan.	5,396	4,089	592	471	5,152	10,548
Feb.	5,681	3,928	742	375	5,045	10,726
Mar.	5,682	4,142	709	483	5,324	11,006
Apr.	5,663	4,046	803	461	5,310	10,973
May	3,806	3,838	680	623	5,141	8,947
June	6,590	4,019	620	585	5,224	11,814
July	5,236	2,589	448	643	3,680	8,916
Aug.	7,571	1,995	756	682	3,433	11,004
Sept.	6,480	4,190	676	581	5,447	11,927
Oct.	....	5,190	742	780	6,712	.....

Consumption[1]

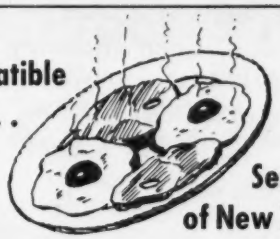
1942	9,392	.....	200	....	200	9,592
1943	9,578	150	1,400	....	1,550	11,128
1944	6,085	6,000	4,400	....	10,400	16,485
1945	3,886	14,500	6,800	....	21,300	25,186
1946	5,714	23,500	13,000	....	36,500	42,214
1947	13,909	22,500	6,500	....	29,000	42,909
1948	28,489	21,500	5,250	....	26,750	55,239
1949	36,117	21,500	3,750	....	25,250	61,367
1950	56,138	31,000	5,500	....	36,500	92,638
1951	46,750	31,031	6,279	2,628	39,938	86,688
1952	53,567	40,562	7,368	3,093	51,023	104,590
1953	67,375	46,473	7,981	3,654	58,108	125,483
1953:						
Oct.	5,897	3,719	660	312	4,563	10,460
Nov.	5,234	3,510	553	244	4,307	9,541
Dec.	5,395	3,475	574	277	4,344	9,739
1954:						
Jan.	5,882	3,475	615	275	4,365	10,247
Feb.	5,595	3,568	575	250	4,393	9,988
Mar.	6,610	3,982	729	335	5,046	11,656
Apr.	5,892	3,748	603	324	4,675	10,567
May	5,969	3,394	586	348	4,328	10,297
June	5,884	3,653	629	402	4,684	10,568
July	4,298	2,587	482	296	3,365	7,663
Aug.	5,228	2,834	561	351	3,746	8,974
Sept.	6,903	3,599	628	379	4,606	11,509
Oct.	7,914	4,314	562	328	5,204	13,118

Stocks at End of Period

1942	13,450	....	....	....	....	13,450
1943	5,638	....	....	....	....	5,638
1944	2,443	....	....	....	....	2,443
1945	3,121	....	....	....	....	3,121
1946	4,865	....	....	....	....	4,865
1947	5,033	....	....	....	....	5,033
1948	11,235	....	....	....	....	11,235
1949	5,063	....	....	....	....	5,063
1950	4,927	....	....	....	....	4,927
1951	4,752	3,727	1,245	532	5,504	10,256
1952	6,201	5,040	1,019	902	6,961	13,162
1953	13,532	4,794	1,117	721	6,632	20,164
1953:						
Oct.	11,126	4,990	1,133	737	6,860	17,986
Nov.	10,834	4,533	1,064	743	6,340	17,174
Dec.	13,532	4,794	1,117	721	6,632	20,164
1954:						
Jan.	12,375	5,001	1,019	703	6,723	19,098
Feb.	12,963	5,269	963	625	6,857	19,820
Mar.	11,870	5,247	975	588	6,810	18,680
Apr.	10,803	5,273	1,062	600	6,935	17,738
May	8,907	5,180	1,110	655	6,945	15,852
June	9,460	5,591	1,020	646	7,257	16,717
July	10,171	5,363	1,004	831	7,198	17,369
Aug.	12,009	4,220	1,019	993	6,232	18,241
Sept.	11,546	4,504	984	908	6,396	17,942
Oct.	11,059	4,868	962	990	6,820	17,879

Source: U. S. Department of Commerce.
Note: (1) GR-S and Neoprene consumption estimated through 1950.

as Compatible as . . . .



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for all purposes

Rubber Industry Employment Earnings and Hours

All Rubber Products

Mo.	1953 Production Workers (thousands)	1953 Average Weekly Earnings	1953 Average Weekly Hours	1953 Average Hourly Earnings	1954 Production Workers (thousands)	1954 Average Weekly Earnings	1954 Average Weekly Hours	1954 Average Hourly Earnings
Jan.	219.2	$78.09	41.1	$1.90	205.7	75.08	38.7	1.94
Feb.	219.2	79.30	41.3	1.92	202.9	75.47	38.9	1.94
Mar.	220.5	80.29	41.6	1.93	199.4	74.31	38.5	1.93
Apr.	226.3	79.32	41.1	1.93	195.2	75.08	38.7	1.94
May	226.2	78.59	40.3	1.95	197.0	77.81	39.7	1.96
June	226.5	78.55	40.7	1.93	198.4	79.60	40.2	1.98
July	219.3	78.98	40.5	1.95	173.1	76.83	39.4	1.95
Aug.	220.7	77.21	39.8	1.94	177.0	76.25	39.1	1.95
Sept.	220.6	74.88	39.0	1.92	202.4	79.60	40.2	1.98
Oct.	215.6	75.07	39.1	1.92	205.6	....	....	....
Nov.	210.0	75.65	39.4	1.92	....	....	....	....
Dec.	208.7	75.66	39.2	1.93	....	....	....	....
					....	....	....	....
Tires and Tubes								
Jan.	91.5	89.24	40.2	2.22	86.4	82.88	37.5	2.21
Feb.	91.2	91.80	40.8	2.25	85.3	83.03	37.4	2.22
Mar.	91.6	93.83	41.7	2.25	84.7	80.89	36.6	2.21
Apr.	95.6	91.58	40.7	2.25	83.2	84.14	37.9	2.22
May	96.2	91.30	40.4	2.26	83.9	88.65	39.4	2.25
June	96.0	89.20	40.0	2.23	85.0	92.06	40.2	2.29
July	93.7	90.45	40.2	2.25	67.3	87.01	38.5	2.26
Aug.	93.3	87.58	39.1	2.24	68.0	85.65	37.4	2.29
Sept.	93.4	83.54	37.8	2.21	87.2	89.95	39.8	2.26
Oct.	90.3	83.16	37.8	2.20	....	....	....	....
Nov.	87.3	85.09	38.5	2.21	....	....	....	....
Dec.	86.7	82.43	37.3	2.21	....	....	....	....
Rubber Footwear								
Jan.	24.5	64.96	40.1	1.62	21.5	62.98	38.4	1.64
Feb.	24.2	67.57	41.2	1.64	20.5	65.57	39.5	1.66
Mar.	24.2	67.57	41.2	1.64	19.6	65.51	39.7	1.65
Apr.	23.8	67.82	41.1	1.65	19.2	63.58	38.3	1.66
May	23.3	60.31	37.0	1.63	19.8	65.46	39.2	1.67
June	23.5	68.06	41.0	1.66	19.8	67.30	40.3	1.67
July	22.5	68.64	41.1	1.67	20.1	68.45	40.5	1.69
Aug.	23.6	65.53	40.2	1.63	20.5	66.40	40.0	1.66
Sept.	24.1	64.24	39.9	1.61	20.9	66.59	39.4	1.69
Oct.	24.0	62.86	38.8	1.62	....	....	....	....
Nov.	23.7	63.57	39.0	1.63	....	....	....	....
Dec.	22.9	65.44	39.9	1.64	....	....	....	....
All Other Rubber Products								
Jan.	103.2	71.74	42.2	1.70	97.8	70.62	39.9	1.77
Feb.	103.8	71.06	41.8	1.70	97.1	70.40	40.0	1.76
Mar.	104.7	71.72	41.7	1.72	95.1	70.22	39.9	1.76
Apr.	106.9	71.21	41.4	1.72	92.8	69.30	39.6	1.75
May	106.7	70.93	41.0	1.73	93.3	70.98	40.1	1.77
June	107.0	71.28	41.2	1.73	93.6	70.98	40.1	1.77
July	103.1	70.64	40.6	1.74	85.7	70.62	39.9	1.77
Aug.	103.8	70.30	40.4	1.74	88.5	71.15	40.2	1.77
Sept.	103.1	69.65	39.8	1.75	94.3	73.03	40.8	1.79
Oct.	101.3	70.70	40.4	1.75	....	....	....	....
Nov.	99.0	70.53	40.3	1.75	....	....	....	....
Dec.	99.1	72.45	40.7	1.78	....	....	....	....

Source: U. S. Department of Labor.

Note: Data are based upon reports from cooperating establishments covering both full and part-time employees who work during, or received pay for, any part of the pay period ending nearest the 15th of the month. These employment series have been adjusted to first quarter 1951 benchmark levels indicated by data from government social insurance programs. Hours and earnings data pertain only to production and related workers.

Spot Closing Cotton Prices

(Middling Upland Grade—New York Market—in Cents)

Average Monthly Price Per Pound

	1947	1948	1949	1950	1951	1952	1953	1954
Jan.	32.58	36.09	33.37	31.89	45.04	42.96	33.24	34.15
Feb.	33.91	33.53	33.41	32.79	(a)	41.64	33.76	35.00
Mar.	35.89	35.04	33.44	32.65	46.06	41.70	34.10	35.23
Apr.	35.89	38.10	33.84	33.23	46.06	41.79	33.85	35.22
May	36.51	38.57	33.73	33.64	46.06	39.68	34.30	35.34
June	37.83	38.12	33.56	34.61	46.06	41.31	34.11	35.17
July	38.03	34.89	32.99	38.11	46.21	40.37	34.20	35.37
Aug.	34.83	32.23	32.06	38.93	35.93	40.42	33.82	35.19
Sept.	32.21	31.92	30.94	41.62	36.20	39.75	33.69	35.46
Oct.	32.39	32.01	30.32	40.66	38.13	37.52	33.53	35.24
Nov.	34.50	32.15	30.52	43.11	42.70	35.59	33.60	34.80
Dec.	36.74	32.90	31.08	43.37	43.32	33.76	33.52	35.03
Average for Year	35.11	34.64	32.44	37.05	42.43	39.71	33.81	35.10

Note: The Government established a ceiling price of 45.76c for spot cotton on March 3, 1951. (a) Trading suspended during February.

Production Index for the Rubber Industry

(1947-1949 = 100)

(Based on man-hours)

	1952	1953	1954		1952	1953	1954
Jan.	116	132	114	July	92	114	85
Feb.	119	140	114	Aug.	109	122	92
Mar.	120	143	118	Sept.	118	122	117
Apr.	114	140	116	Oct.	131	127	....
May	111	137	118	Nov.	129	120	....
June	115	131	121	Dec.	123	111	....

Sales by the Rubber Industry

(in Millions of Dollars*)

	1952	1953	1954		1952	1953	1954
Jan.	408	424	348	July	377	448	374
Feb.	402	435	351	Aug.	388	409	337
Mar.	400	473	388	Sept.	427	416	334
Apr.	407	444	375	Oct.	423	395	....
May	402	422	357	Nov.	383	346	....
June	409	436	377	Dec.	418	369	....

Rubber Manufacturers' Inventories

(in Millions of Dollars*)

	1952	1953	1954		1952	1953	1954
Jan.	809	866	844	July	890	925	784
Feb.	842	868	857	Aug.	877	897	761
Mar.	857	880	849	Sept.	871	908	804
Apr.	850	874	812	Oct.	866	881	....
May	855	888	810	Nov.	850	867	....
June	851	914	829	Dec.	877	868	....

Source: U. S. Department of Commerce.
Notes: * Adjusted for seasonal variation.

No. 1 R.S.S.—Annual Average Prices

(New York Market—Cents per Pound)

Year	High	Low	Avg.	Year	High	Low	Avg.
1913	113	59	82.04	1934	15⅞	8¾	12.92
1914	93	56	65.33	1935	13¾	10½	12.37
1915	79	58½	65.85	1936	23	13½	16.41
1916	102	55	72.50	1937	26⅞	14	19.39
1917	90	52	72.23	1938	17⅞	10¼	14.64
1918	70	40	60.15	1939	24	14⅛	17.57
1919	57	38½	48.70	1940	24	18¾	20.10
1920	56½	16	36.30	1941	24⅞	19⅛	22.40
1921	21¾	11½	16.36	1942	22½	22½	22.50
1922	28⅜	13⅝	17.50	1943	22½	22½	22.50
1923	37⅛	24¾	29.45	1944	22½	22½	22.50
1924	40⅞	17⅜	26.20	1945	22½	22½	22.50
1925	121	34⅜	72.46	1946	22½	22½	22.50
1926	88⅛	36¾	48.50	1947	25	14	20.00
1927	41¾	33	37.72	1948	25	18	21.99
1928	41¼	17	22.48	1949	19¾	15⅜	17.57
1929	26⅞	15½	20.55	1950	86	18	41.10
1930	16½	7½	11.98	1951	76	52	(a)
1931	8⅜	4¼	6.17	1952*	33	26½	29.15
1932	4¼	2½	3.49	1953	31⅞	19⅞	24.21
1933	9⅞	2⅞	5.96	1954	34½	19½	23.61

Note: Price was fixed by Government on August 6, 1941, at 22½c a pound for non-war uses. Free trading was resumed May 1, 1947. (a) Free trading suspended March 31, 1951. GSA selling price ranged between 52 and 66c during balance of year. * Free trading was resumed on July 1, 1952; figures represent only July through December, 1952.

No. 1 R.S.S.—Monthly Average Prices

(New York Market—Cents per pound)

	1947	1948	1949	1950	1951	1952	1953	1954
Jan.	22.50 (b)	21.83	19.23	18.33	71.21	....	29.40	20.22
Feb.	25.75 (b)	20.42	18.49	19.40	73.61	....	27.57	19.98
Mar.	25.75 (b)	20.33	19.08	19.86	72.05	....	26.59	20.16
Apr.	25.75 (b)	22.87	18.53	23.51	....	....	24.66	22.06
May	21.04	23.39	17.92	28.07	....	....	25.52	21.96
June	16.29	22.80	16.36	30.92	....	....	24.42	23.01
July	15.48	24.24	16.45	39.10	....	30.52	23.64	24.12
Aug.	15.23	23.63	16.60	51.63	....	29.36	23.36	23.26
Sept.	16.55	22.81	17.58	55.98	....	27.42	23.06	23.99
Oct.	20.38	22.13	16.31	62.19	....	27.06	20.82	26.57
Nov.	23.57	20.52	16.70	73.05	....	29.25	20.58	28.07
Dec.	21.45	18.86	17.53	71.20	....	31.26	20.92	29.88
Average for Year	20.00	21.99	17.57	41.10	(a)	29.15	24.21	23.61

Notes: (a) Free trading suspended March 31, 1951, and resumed on July 1, 1952. (b) Price fixed by Government.

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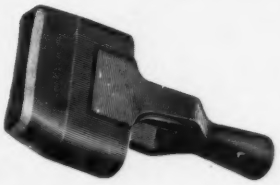

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Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1944 (total)	6,654	26,439	263	33,356	33,446	2,013
Passenger Car.	208	18,330	130	18,668	18,819	1,218
Truck and Bus	6,446	8,109	133	14,688	14,627	795
1945 (total)	5,984	36,479	504	42,967	44,524	3,077
Passenger Car.	1,115	25,463	222	26,800	28,200	2,214
Truck and Bus	4,869	11,016	282	16,167	16,324	863
1946 (total)	15,310	65,490	1,512	82,312	82,298	2,448
Passenger Car.	11,086	54,684	653	66,423	66,466	1,763
Truck and Bus	4,224	10,806	859	15,889	15,832	685
1947 (total)	25,056	62,871	3,256	91,183	95,550	6,949
Passenger Car.	19,644	52,857	1,608	74,109	77,795	5,444
Truck and Bus	5,412	10,014	1,648	17,074	17,755	1,505
1948 (total)	26,845	49,148	1,787	77,781	81,314	10,698
Passenger Car.	21,589	41,295	656	63,540	66,738	8,773
Truck and Bus	5,256	7,853	1,132	14,241	14,576	1,925
1949 (total)	31,584	43,466	1,467	76,517	76,369	10,638
Passenger Car.	28,129	36,440	509	65,077	65,140	8,904
Truck and Bus	3,456	7,026	958	11,440	11,228	1,734
1950 (total)	41,349	56,808	1,430	99,587	92,754	3,794
Passenger Car.	36,678	47,103	642	84,423	78,598	3,050
Truck and Bus	4,671	9,705	788	15,164	14,156	743
1951 (total)	32,153	44,612	1,677	78,442	83,405	8,765
Passenger Car.	26,729	34,226	723	61,678	65,546	6,973
Truck and Bus	5,424	10,386	954	16,764	17,859	1,791
1952 (total)	29,484	54,342	1,520	85,346	90,411	14,110
Passenger Car.	24,106	45,458	741	70,305	74,341	11,251
Truck and Bus	5,378	8,884	779	15,041	16,070	2,859
1953 (total)	37,949	55,124	1,543	94,617	96,150	15,720
Passenger Car.	33,106	45,798	809	79,713	81,455	13,044
Truck and Bus	4,843	9,326	734	14,904	14,696	2,676
1954:						
Jan. (total)	2,891	3,993	118	7,002	6,299	14,977
Passenger Car.	2,549	3,378	59	5,986	5,251	12,279
Truck and Bus	342	615	59	1,016	1,048	2,698
Feb. (total)	2,634	3,557	117	6,308	7,042	15,709
Passenger Car.	2,323	3,001	60	5,384	5,952	12,832
Truck and Bus	311	556	57	924	1,089	2,877
Mar. (total)	3,163	4,350	116	7,629	7,981	16,077
Passenger Car.	2,809	3,753	45	6,607	6,878	13,112
Truck and Bus	354	597	71	1,022	1,103	2,966
Apr. (total)	3,131	4,935	176	8,243	8,065	15,906
Passenger Car.	2,785	4,328	95	7,208	7,031	12,955
Truck and Bus	346	607	81	1,035	1,034	2,951
May (total)	3,020	5,115	184	8,319	7,965	15,504
Passenger Car.	2,695	4,503	101	7,300	6,985	12,575
Truck and Bus	324	612	83	1,020	980	2,928
June (total)	2,890	6,029	160	9,079	8,796	15,218
Passenger Car.	2,587	5,326	89	8,002	7,755	12,323
Truck and Bus	303	703	71	1,076	1,041	2,895
July (total)	2,782	5,948	155	8,884	6,360	12,640
Passenger Car.	2,516	5,222	73	7,812	5,605	10,063
Truck and Bus	265	725	82	1,073	755	2,577
Aug. (total)	2,527	5,429	123	8,080	5,427	9,985
Passenger Car.	2,284	4,605	73	6,962	4,710	7,797
Truck and Bus	243	824	51	1,118	717	2,188
Sept. (total) ...	1,601	4,537	130	6,269	7,279	11,184
Passenger Car.	1,375	3,825	73	5,273	6,242	8,951
Truck and Bus	227	712	57	995	1,037	2,233
Oct. (total)	1,868	4,251	147	6,266	7,869	12,799
Passenger Car.	1,617	3,423	81	5,121	6,702	10,531
Truck and Bus	251	828	67	1,146	1,167	2,268

Source: The Rubber Manufacturers Association, Inc.

Automobile Production in U. S.

(Civilian Production Only)

Year	Passenger Cars	Trucks	Total	Year	Passenger Cars	Trucks	Total
1934	2,177,919	575,192	2,753,111	1944	0	124,819	124,819
1935	3,252,244	694,690	3,946,934	1945	83,792	313,643	397,435
1936	3,669,528	781,862	4,451,390	1946	2,148,699	930,760	3,079,459
1937	3,915,889	892,382	4,808,271	1947	3,558,178	1,220,634	4,778,812
1938	2,000,985	485,852	2,486,837	1948	3,909,270	1,363,856	5,273,126
1939	2,866,796	704,308	3,571,104	1949	5,108,841	1,123,736	6,232,577
1940	3,692,328	721,637	4,413,965	1950	6,665,836	1,332,263	7,998,099
1941	3,744,500	875,381	4,619,681	1951	5,337,729	1,420,432	6,758,161
1942	220,814	133,083	353,897	1952	4,320,794	1,212,790	5,533,584
1943	0	4,501	4,501	1953	6,121,787	1,202,196	7,323,983
1953:							
Jan.	453,319	111,599	564,918	July	599,134	105,622	704,756
Feb.	486,071	96,740	582,811	Aug.	513,457	101,478	614,935
Mar.	566,320	134,129	700,449	Sept.	475,289	98,051	573,340
Apr.	596,633	126,754	723,387	Oct.	528,088	91,955	620,043
May	549,677	93,443	643,120	Nov.	378,406	73,710	452,116
June	587,549	74,063	661,612	Dec.	387,844	94,652	482,496
1954:							
Jan.	454,562	96,167	550,729	July	451,663	78,507	530,170
Feb.	446,676	87,141	533,817	Aug.	445,306	75,835	521,141
Mar.	531,529	101,177	632,706	Sept.	300,998	68,618	369,616
Apr.	534,667	96,723	631,390	Oct.	221,195	65,965	287,160
May	497,062	91,226	588,288	Nov.	498,248	89,232	587,480
June	507,055	91,470	598,525	Dec.	.....	.....	.....

Source: Automobile Manufacturers Association.
Note: Figures are based on factory sales. Revisions are made from time to time in these figures and the latest issue should be consulted for accuracy.

Automotive Inner Tubes

(Thousands of Units)

	Shipments					
Year	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1944	6,460	20,569	196	27,224	27,488	2,813
1945	5,988	33,906	411	40,304	41,742	3,627
1946	15,327	59,357	1,424	76,108	77,251	3,820
1947	25,046	46,560	2,483	74,088	79,181	8,059
1948	26,833	40,548	1,119	68,499	70,033	9,641
1949	31,521	31,450	887	63,858	65,114	10,657
1950	41,240	42,671	811	84,723	80,179	...
1951	32,151	32,284	1,071	65,507	67,249	10,094
1952	29,451	32,985	1,014	63,449	65,073	12,036
1953	37,957	36,072	878	74,907	74,425	11,874
1954:						
Jan.	2,884	3,892	58	6,834	5,395	10,107
Feb.	2,636	2,908	74	5,617	5,896	10,448
Mar.	3,165	2,774	74	6,013	6,399	10,869
Apr.	3,134	2,770	97	6,001	6,266	11,234
May	3,017	2,900	84	6,002	5,909	11,170
June	2,889	3,657	85	6,631	5,739	10,379
July	2,707	3,471	87	6,265	4,132	8,429
Aug.	2,174	3,504	69	5,748	3,773	6,588
Sept.	1,130	2,839	64	4,034	4,490	7,179
Oct.	429	2,566	92	3,087	3,953	8,313

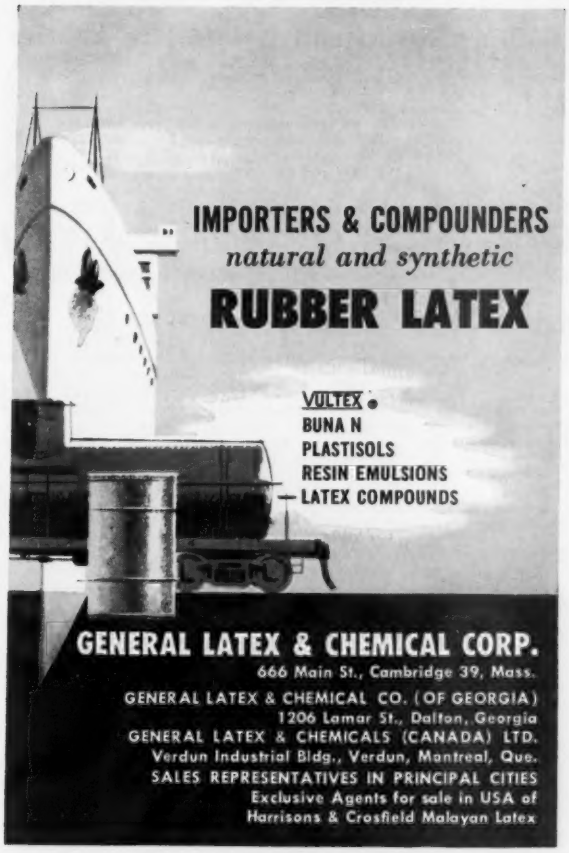
Source: The Rubber Manufacturers Association, Inc.

Vinyl and Vinyl Copolymer Resins—Sales

(Thousands of Pounds—Resin Content)

	Polyvinyl Chloride and Copolymer Resins							All Other Vinyl Resins		
	Film	Sheeting	Molding & Extrusion	Textile & Paper Treating	Flooring	Protective Coatings	All Other Uses	Adhesives	All Other Uses	Grand Total
1953	63,691	62,385	129,215	52,353	22,152	22,823	27,790	22,411	77,478	480,299
1953										
July	4,638	2,821	8,580	3,376	1,507	1,798	2,500	1,859	6,402	33,481
Aug.	4,903	4,609	8,650	3,851	2,063	1,850	2,412	1,721	6,121	36,180
Sept.	5,318	4,855	9,485	4,281	2,073	1,948	2,284	2,000	5,824	38,066
Oct.	5,568	5,081	10,219	4,542	2,279	1,707	2,941	2,049	7,118	41,505
Nov.	4,507	4,126	9,443	3,615	1,447	1,561	2,446	1,755	6,711	35,610
Dec.	4,965	4,579	12,469	4,024	1,549	1,789	3,456	1,721	7,123	41,676
1954										
Jan.	4,869	5,435	10,120	4,638	911	1,614	1,731	1,825	5,988	37,131
Feb.	5,170	5,720	10,711	4,346	1,170	1,829	2,407	2,038	6,712	40,103
Mar.	7,348	6,790	12,255	4,826	1,432	2,029	2,392	2,622	6,127	45,819
Apr.	6,457	6,455	12,568	4,479	1,894	1,864	2,311	2,407	6,325	44,700
May	4,775	3,840	11,096	3,582	3,256	1,730	2,643	2,578	6,010	39,510
June	5,100	3,003	10,529	3,552	3,554	1,916	2,744	2,500	5,343	38,241
July	5,114	3,441	9,648	3,105	3,356	1,859	2,598	1,951	5,010	36,082
Aug.	7,078	4,522	14,541	4,259	3,931	2,198	3,407	2,444	5,804	48,183
Sept.	5,665	4,340	13,454	3,784	3,797	2,242	3,779	2,379	5,768	45,208
Oct.	....	....	....	....	....	....	....	....	....	....
Nov.	....	....	....	....	....	....	....	....	....	....
Dec.	....	....	....	....	....	....	....	....	....	....

Source: Chemical Division, U. S. Tariff Commission.



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Various Compounding Materials Consumed by the Rubber Industry

Material	1947	1948	1949	1950	1951	1952	1953
Antimony, Primary:							
Short tons	39	41	55	103[c]	19[c]	66	20
% of total	.002	.003	.005	.007	.001	.004	.001
Asphalt: [a]							
Short tons	32,113	19,967	18,050	26,819	21,414	33,288	.....
% of total	0.7	0.4	0.3	0.3	0.3	0.4	.....
Barite (Barytes):							
Short tons	17,000	18,000	14,000	19,000	15,000	14,000	.....
% of total	3.1	2.85	2.53	3.31	2.13	2.0	.....
Carbon Black:							
Short tons	471,790	435,282	383,565	515,184	530,614	537,273	566,797
% of total	94.3	95.5	93.3	92.9	93.9	93.1	94.4
Clay, Kaolin:							
Short tons	166,201	176,965	197,341	263,306	231,331	240,982	.....
% of total	11.5	11.3	13.1	15.0	12.7	13.2	.....
Clay, Fire & Stoneware:							
Short tons	17,970	15,480	27,148	9,500	.....	9,322	.....
% of total	0.2	0.2	0.3	0.1	.....	0.1	.....
Lime:							
Short tons	589	1,154	715	908	1,126	2,000	.....
% of total	0.01	0.02	.0002	.0002	[d]	[d]	.....
Litharge:							
Short tons	2,205	2,835	1,398	3,047	2,641	2,109	.....
% of total	1.3	1.8	1.2	1.7	1.7	1.5	.....
Lithopone:							
Short tons	3,085	4,192	3,245	4,092	3,295	1,523	.....
% of total	1.9	3.0	4.1	3.9	3.2	2.5	.....
Mica, Ground:							
Short tons	3,900	4,372	3,856	5,776	6,551	5,126	.....
% of total	6.0	7.0	7.0	8.0	9.0	7.0	.....
Sulfur:							
Short tons	72,800	70,560	59,360	75,000	75,000	75,000	.....
% of total	1.8	1.7	1.5	1.3	1.6	1.6	.....
Talc: [b]							
Short tons	71,840	66,226	53,400	75,900	70,970	64,476	.....
% of total	13.9	13.0	12.0	12.0	11.2	10.9	.....
Zinc Oxide:							
Short tons	82,248	82,895	58,496	82,944	71,507	72,774	.....
% of total	51.2	54.9	52.5	51.6	48.4	51.2	.....

Source: U. S. Bureau of Mines.
Notes: (a) Solid and semi-solid products of less than 200 penetration. (b) Includes prophyllite and ground soapstone. (c) Does not include precipitated antimony sulfide as in previous years. (d) Negligible.

Reclaimed Rubber

(Including Natural and Synthetic)

(All Quantities in Long Tons)

Year	Production	Consumption: Tons	Consumption: % to Crude [a]	Exports	Stocks On Hand at End of Period
1937	185,033	162,000	29.8	13,233	28,800
1938	122,400	120,800	27.6	7,403	23,000
1939	186,000	170,000	28.7	12,611	25,250
1940	208,971	190,244	29.3	11,347	32,636
1941	274,202	251,231	32.2	13,851	41,750
1942	286,007 [b]	254,820	64.6	30,405	42,532
1943	304,058 [c]	291,082	59.6	15,678	46,201
1944	260,631 [d]	251,083	35.3	11,800	43,832
1945	243,309	241,036	30.2	13,413	28,155
1946	295,612	275,410	26.5	14,461	33,666
1947	291,395	288,395	24.8	14,556	35,943
1948	266,861	261,113	24.4	11,428	32,630
1949	224,029	226,679	22.5	10,637	28,263
1950	314,008	303,733	24.1	11,740	35,708
1951	366,700	346,121	28.6	14,722	45,082
1952	274,981	280,002	22.2	11,180	30,664
1953	298,336	285,050	21.3	11,597	32,319
1953:					
Dec.	21,463	18,858	20.2	1,031	32,319
1954:					
Jan.	20,026	19,114	19.7	912	31,865
Feb.	21,122	19,461	20.3	941	32,393
Mar.	23,383	22,882	20.8	830	32,148
Apr.	21,658	21,883	20.8	1,050	31,359
May	21,316	20,536	19.7	1,071	31,105
June	22,342	22,321	20.0	1,068	30,845
July	18,041	16,301	20.5	586	31,304
Aug.	15,519	17,660	22.0	647	27,692
Sept.	22,352	19,926	18.8	641	29,632
Oct.	23,499	21,897	19.2	644	30,873

Source: U. S. Department of Commerce.
Notes: (1) These figures are revised from time to time and the latest available issue should be consulted for the most accurate data. (a) Includes natural and synthetic rubber. (b) Includes 893 tons of imports. (c) Includes 67 tons of imports. (d) Includes 21 tons of imports.

Cotton, Rayon and Nylon Tire Fabrics

(Production in Thousands of Pounds)

	Cotton: Tire Cord Not Woven	Cotton: Cord Fabric Woven	Cotton: Chafer and All Other Tire Fabrics	Cotton: Total	Rayon and Nylon [b]: Tire Cord not Woven	Rayon and Nylon [b]: Tire Cord and Other Tire Fabrics	Rayon and Nylon [b]: Total
1952:							
Jan.-Mar.	11,226	36,378	12,971	60,575	14,434	72,249	86,683
Apr.-June	4,661	24,612	10,742	40,015	16,874	81,249	98,123
July-Sept.	335	9,257	9,460	19,052	18,128	80,355	98,483
Oct.-Dec.	*c*	4,728*a*	11,580	16,308	19,436	81,171	100,607
Total*	15,887	74,834	48,280	139,001	68,873	323,106	391,979
1953:							
Jan.-Mar.	*c*	4,378*a*	15,477	19,855	20,487	91,742	112,229
Apr.-June	*c*	5,713*a*	15,880	21,593	18,906	95,711	114,617
July-Sept.	*c*	3,562*a*	13,193	16,755	18,597	89,821	108,418
Oct.-Dec.	*c*	2,460	11,569	14,029	19,664	79,259	98,293
Total*	*c*	16,113	57,103	73,216	77,654	370,137	447,791
1954:							
Jan.-Mar.	*c*	2,585	13,229	15,814	17,297	78,388	95,685
Apr.-June	*c*	4,067	12,830	16,897	12,436	75,153	87,589
July-Sept.	.....	.....	.....	.....	.....	.....	.....
Oct.-Dec.	.....	.....	.....	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	.....

Source: Bureau of the Census, U. S. Department of Commerce.
Notes: (a) Included with tire cord and fabrics to avoid disclosures of operations of individual mills. (b) Fuel cell fabrics are not included with rayon and nylon tire cord and fabrics. (c) Included with tire cord woven. (d) Included with chafer and all other tire fabrics. * Revised.

Gasoline Consumption

(In Thousands of Barrels of 42 Gallons)

	1947	1948	1949	1950	1951	1952	1953	1954
Jan.	57,057	61,308	63,125	66,981	80,670	86,863	89,634	89,852
Feb.	50,551	56,487	57,980	53,274	72,864	82,043	86,458	86,206
Mar.	59,947	68,171	73,282	78,780	86,962	87,065	98,158	101,549
Apr.	64,140	72,183	75,318	80,350	87,573	98,653	102,044	103,866
May	70,865	77,186	81,665	89,035	100,266	101,137	105,918	104,418
June	71,329	78,044	83,374	90,174	96,364	99,305	114,703	113,037
July	73,441	81,428	83,129	91,677	100,567	105,307	112,960	112,231
Aug.	72,089	80,351	84,707	94,507	101,453	102,954	109,124	110,223
Sept.	71,384	76,159	80,832	86,725	91,891	100,095	106,158	104,706
Oct.	73,277	75,164	79,327	89,067	100,209	103,689	106,037	.....
Nov.	64,158	72,560	76,346	82,688	88,581	91,326	99,210	.....
Dec.	67,506	72,162	75,628	81,032	84,551	95,817	100,225	.....
Total	795,015	871,270	913,713	994,290	1,091,951	1,154,254	1,230,629	.....

Source: U. S. Bureau of Mines.

Rim Production

	1949	1950	1951	1952	1953
Passenger Car	27,715,344	35,096,404	29,145,367	24,936,844	31,318,461
Truck & Bus	4,238,174	6,625,129	6,877,419	5,752,674	5,228,321
Agricultural	2,695,430	2,853,483	3,019,581	2,073,116	1,943,487
Earth Mover	9,895	15,602	28,026	31,791	24,685
Total	34,658,843	44,590,618	39,070,393	32,794,425	38,514,954

	1954: June	July	Aug.	Sept.	Oct.	Nov.
Passenger Car	2,339,894	1,651,127	1,742,770	1,532,839	1,769,718	2,367,206
Truck & Bus	389,065	228,013	204,131	399,819	389,479	390,674
Agricultural	117,523	82,385	67,963	82,856	86,196	100,364
Earth Mover	2,206	472	323	2,204	1,592	2,013
Total	2,848,688	1,961,997	2,015,187	2,017,718	2,246,985	2,860,257

Source: The Tire & Rim Association, Inc.

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"Help Wanted" continued on next page

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"Help Wanted" continued on next page

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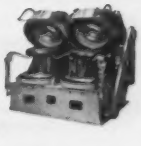

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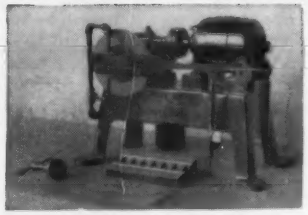
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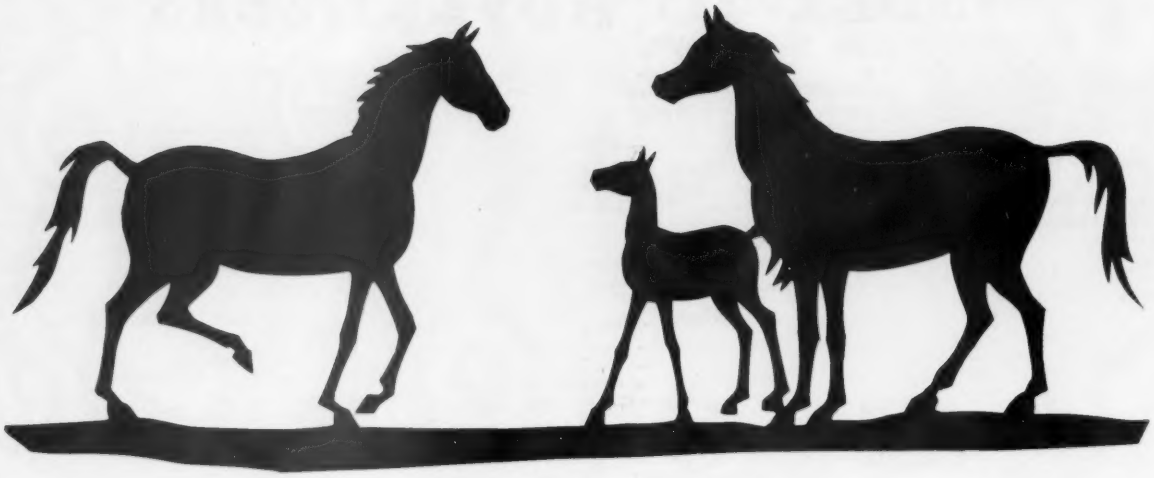

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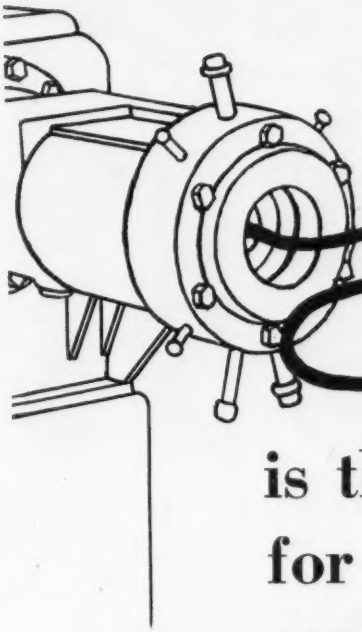

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